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Report to the Chairman, Subcommittee on Oversight and Investigations, Committee on Energy and Commerce, House of Representatives

July 1990

AIR POLLUTION

EPA Not Adequately Ensuring Vehicles Comply With Emission Standards

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Resources, Community, and
Economic Development Division

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July 25, 1990

The Honorable John D. Dingell
Chairman, Subcommittee on
Oversight and Investigations
Committee on Energy and Commerce
House of Representatives

Dear Mr. Chairman:

This report responds to your request that we assess the effectiveness of the Environmental Protection Agency's (EPA) efforts to control air pollution from motor vehicles. The report discusses the adequacy of EPA's efforts to (1) identify vehicles exceeding emission standards before and after they are sold to the public, (2) ensure that such vehicles are returned to compliance, and (3) monitor state programs to reduce motor vehicle emissions.

Unless you publicly release its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies of the report to appropriate congressional committees; the Administrator, EPA; and other interested parties. We will make copies available to others upon request.

This work was performed under the direction of Richard L. Hembra, Director, Environmental Protection Issues, who may be reached at (202) 275-6111. Major contributors to this report are listed in appendix II.

Sincerely yours,

J. Dexter Peach
Assistant Comptroller General

Executive Summary

Purpose

The nation's 157 million motor vehicles—122 million cars and 35 million light duty trucks—are a major source of air pollution, mainly ozone, or smog, and carbon monoxide. Currently, motor vehicles are responsible for over one-half of the annual emissions of these pollutants, which irritate the eyes, aggravate the respiratory system, and disrupt the flow of oxygen to the body's organs and tissues. The Clean Air Act and subsequent amendments required the Environmental Protection Agency (EPA) to establish programs to limit vehicles' contribution to air pollution.

The Chairman, Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, requested GAO to review the effectiveness of EPA's efforts to control air pollution from motor vehicles. GAO reviewed the adequacy of EPA's efforts to (1) identify vehicles exceeding emission standards before and after the vehicles are sold to the public, (2) ensure that such vehicles are returned to compliance, and (3) monitor state programs to reduce motor vehicle emissions.

Background

The Clean Air Act, as amended, established limits on the amounts of pollutants motor vehicles can emit throughout their useful life, which for passenger cars the act defined as 5 years or 50,000 miles. In carrying out its responsibility for ensuring that vehicles meet the mandated emission standards, EPA tests vehicles (1) before they are sold to the public in order to certify they will meet the standards when in use and (2) after they are purchased, driven, and properly maintained in order to determine if the vehicles actually comply with the standards during their useful life. The Congress is currently considering Clean Air Act reauthorization legislation, which may toughen emission standards and extend the useful life of passenger cars.

In addition, many states have implemented motor vehicle inspection/maintenance (I/M) programs for metropolitan areas exceeding air quality standards for ozone and/or carbon monoxide. These programs are complementary to, but different from, the federal emission testing program in that they (1) identify vehicles emitting excessive amounts of pollutants because of poor maintenance or tampering and (2) require such vehicles' repair by their owners. EPA is responsible for approving these state programs and ensuring their effectiveness.

Results in Brief

EPA's program for testing vehicles before they are sold to the public is not adequately identifying those that will fail to meet emission standards in use. EPA relies on emission testing of prototype vehicles and

projected deterioration rates to forecast expected emission system performance. However, EPA's procedure for calculating emission system deterioration rates does not reflect the actual conditions under which vehicles are used. Three-fourths of the vehicles EPA has tested since 1981 after they have been used by the public have failed to meet the standards because the emission systems actually deteriorated at a rate significantly greater than projected.

In its testing of vehicles after they have been sold to the public, EPA has little assurance it is identifying all properly maintained in-use vehicles that are failing to meet the standards. Because of resource constraints, EPA, since 1981, has reduced by one-half its testing of in-use vehicles. EPA's testing now accounts for only one-third of the vehicles of the most recently tested model year. EPA tests the vehicles it believes are most likely to fail to meet the standards, but the agency is unable to verify that the remaining two-thirds are meeting the standards.

When EPA identifies failing vehicles, it orders their recall so that they can be returned to compliance; however, the public is not required to have the vehicles repaired and has been reluctant to do so. Between 1985 and 1987, less than one-half of the vehicles recalled for emission system problems were repaired. Options exist for improving the response to recalls, but EPA has not pursued them.

In its monitoring of state I/M programs, EPA is not ensuring that they comply with approved plans and operate effectively. EPA lacks sufficient data to measure programs' compliance because states are not providing EPA with comprehensive program data. Further, EPA does not routinely determine the effectiveness of all programs in meeting specified emission reduction requirements.

Principal Findings

Forecasts Have Been Inaccurate

All vehicles sold in the United States must be certified by EPA as capable of meeting federal emission standards throughout their useful life. To do this, EPA requires manufacturers to submit test data for each engine family—vehicles with common engines and emission systems—they intend to sell. The data consist of the results of emission testing and a deterioration rate determined by the manufacturer in accordance with an EPA-approved test procedure. This test procedure, however, does not

accurately forecast actual emission system deterioration. For example, for 1984-86 model year cars, carbon monoxide emissions, which were forecasted to increase about 13 percent during the vehicles' useful life, in fact increased about 122 percent.

Because the test procedure understates emission system deterioration, EPA's predictions of vehicles' compliance with federal emission standards have been inaccurate. EPA data show that since 1981, about 75 percent of the vehicles EPA has tested after consumer use have exceeded the standards. EPA recognizes that the procedure for determining deterioration rates needs to be revised to reflect actual on-road conditions, but EPA currently has no plans to revise it because doing so would require additional resources.

Testing Levels Have Been Inadequate

Because of funding constraints, EPA has reduced the number of vehicles it tests to monitor manufacturers' compliance with federal emission standards. This reduction has significantly affected EPA's ability to ensure it has identified all classes of in-use vehicles failing to meet the standards. EPA has reduced in-use testing by over 50 percent since 1981, and for this type of testing, manufacturers' data are not available.

To compensate for its reduced testing, EPA attempts to target the vehicles most likely to fail in-use testing. Although EPA officials believe they have identified most vehicles that are failing to meet emission standards, GAO found that EPA does not sample nontargeted vehicles. As a result, EPA has no assurance that two-thirds of the vehicles of the most recent model year fleet—unrepresented in the agency's testing—are actually meeting the standards.

Many Vehicles Failing Standards Have Not Been Repaired

EPA has the authority to require manufacturers to recall and repair in-use vehicles that fail to meet emission standards. However, less than half of the vehicle owners respond to manufacturers' recalls. From 1985 to 1987, only about 3 million, or approximately 46 percent, of the 6.5 million vehicles recalled were brought in for emission system repairs. EPA and vehicle manufacturers consider this response rate unsatisfactory.

Options such as tying recalls to state vehicle registration or I/M programs, or requiring manufacturers to meet a minimum recall response rate could increase the number of emission systems repaired. For

example, a California pilot program tying recalls to registration is projected to increase the recall response rate to about 90 percent. However, EPA currently does not have the legal authority to require that owners have vehicles repaired as a condition for state registration or that manufacturers meet a minimum recall rate, and EPA would have to change its regulations to tie recalls to state I/M programs. EPA has not established a timetable for pursuing these options to increase the recall response rate.

Monitoring of Inspection/ Maintenance Programs Has Been Inadequate

State I/M programs must meet certain specifications, such as a required number of vehicles to be tested annually. However, EPA is unable to determine if all programs comply with these specifications because it has not required states to provide the specific data needed to assess compliance. Twenty-one of the 36 programs in operation from January 1987 to June 1989 provided 50 percent or less of the needed data. Further, EPA has not measured 14 programs' effectiveness in meeting their emission reduction requirement.

Recommendations to the Agency

To better identify vehicles that exceed emission standards, GAO recommends among other things that the Administrator, EPA,

- change the method for (1) determining deterioration rates of emission systems to provide more accurate forecasts of the emission levels of in-use vehicles and (2) selecting vehicles for in-use testing to provide more comprehensive coverage of the in-use vehicle fleet (see ch. 2) and
- select and implement the best option to increase the response rate to emission system recalls (see ch. 3).

GAO is also making other recommendations to improve the oversight of state I/M programs (see ch. 4).

Recommendation to the Congress

Currently proposed amendments to the Clean Air Act would provide EPA with the authority to recover a portion of its in-use testing costs by charging these costs to manufacturers. GAO recommends that the Congress include in final Clean Air Act legislation such a user fee provision.

Agency Comments

GAO discussed the information in this report with EPA officials, who generally agreed with the information presented. However, as requested by the Chairman, GAO did not obtain official agency comments on this report.

Contents

Executive Summary		2
Chapter 1 Introduction		8
	Clean Air Act Established Vehicle Emission Standards	11
	EPA Office of Mobile Sources Tests Vehicles	11
	Objectives, Scope, and Methodology	14
Chapter 2 Inadequate Forecasting and Monitoring Inhibit Vehicle Emission Control		17
	OMS' Forecasts of Vehicles' Compliance With Emission Standards Have Not Been Accurate	18
	Testing Reductions Hamper OMS' Ability to Monitor In-Use Vehicles	21
	Proposed Legislation Could Affect Testing Programs	26
	Conclusions	29
	Recommendations to the Administrator, EPA	31
	Recommendation to the Congress	31
Chapter 3 Efforts to Recall In-Use Vehicles Have Not Been Effective		32
	Manufacturers Are Required to Recall In-Use Vehicles That Do Not Meet Standards	32
	Public Response to Recall Notices Is Limited	33
	Options Exist for Improving Response to Recalls of In-Use Vehicles	34
	Conclusions	36
	Recommendation	37
Chapter 4 OMS' Monitoring of Vehicle Inspection/Maintenance Programs Is Inadequate		38
	OMS Oversees I/M Programs	38
	OMS Has Insufficient Data to Measure I/M Programs' Compliance	39
	OMS Has Not Assessed the Effectiveness of Many Programs	42
	Conclusions	44
	Recommendations	44
Appendixes		
	Appendix I: Inspection/Maintenance Programs in Operation as of August 1989	46
	Appendix II: Major Contributors to This Report	48

Table

Table 2.1: In-Use Test Failures for Model Year 1986 Vehicles 19

Figures

Figure 1.1: Areas in the United States That Exceeded Air Quality Standards for Ozone and/or Carbon Monoxide 9
Figure 1.2: U.S. Sources of Air Pollution 10
Figure 1.3: A Vehicle on a Dynamometer 12
Figure 2.1: Comparison of Failure Rate and Fleet Coverage of In-Use Vehicles, Model Years 1981 to 1986 24

Abbreviations

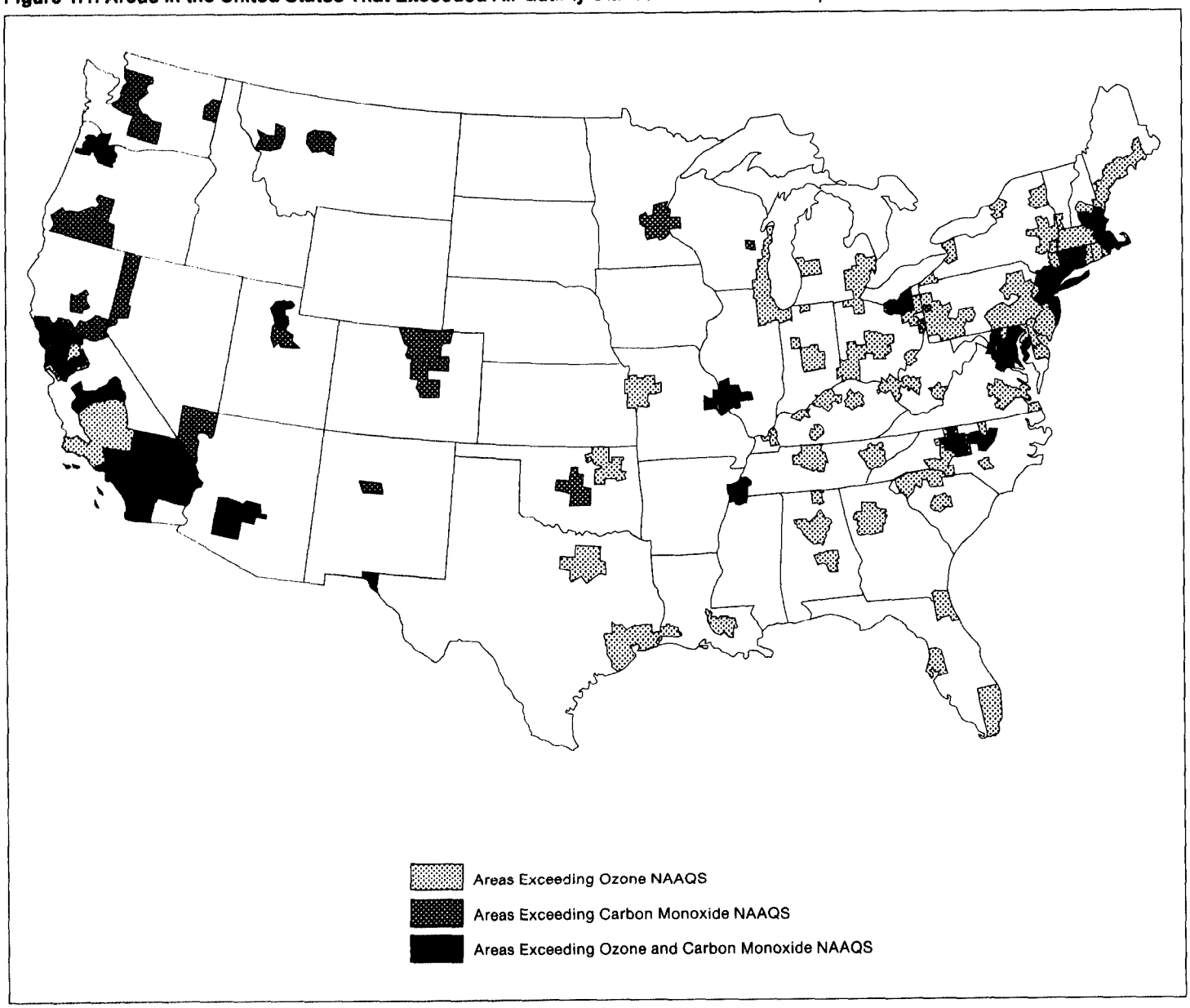
EPA	Environmental Protection Agency
GAO	General Accounting Office
I/M	inspection/maintenance
NAAQS	National Ambient Air Quality Standards
NESCAUM	Northeast States for Coordinated Air Use Management
OMS	Office of Mobile Sources
RCED	Resources, Community, and Economic Development Division
SIP	State Implementation Plan

Introduction

For nearly 3 decades, the public has become increasingly concerned about the need to improve our nation's air quality. Increased burning of coal, oil, and other fossil fuels to satisfy our energy needs is responsible for smog that is in our cities, acid rain that is damaging our forests, and greenhouse gases that may lead to global warming. Of particular concern have been the health problems related to high levels of ozone, commonly referred to as smog, and of carbon monoxide.

On the basis of data compiled between 1986 and 1988, the Environmental Protection Agency (EPA) has identified locations that did not meet national air quality standards for ozone and carbon monoxide. Formed through the chemical reaction of hydrocarbons and nitrogen oxides in the presence of sunlight, ozone irritates the eyes, aggravates respiratory problems, and causes crop damage. The 101 locations that did not meet the standard for ozone were mostly major metropolitan areas, inhabited by nearly 112 million people. Carbon monoxide, a colorless, odorless gas that is poisonous and harmful to human health, also poses a significant air pollution problem. When inhaled, carbon monoxide enters the bloodstream and disrupts the delivery of oxygen to the body's organs and tissues. EPA has identified 44 areas—inhabited by over 29 million people—that exceeded acceptable carbon monoxide levels. Figure 1.1 shows the areas of the country that exceeded the National Ambient Air Quality Standards (NAAQS) for ozone and/or carbon monoxide.

Figure 1.1: Areas in the United States That Exceeded Air Quality Standards for Ozone and/or Carbon Monoxide

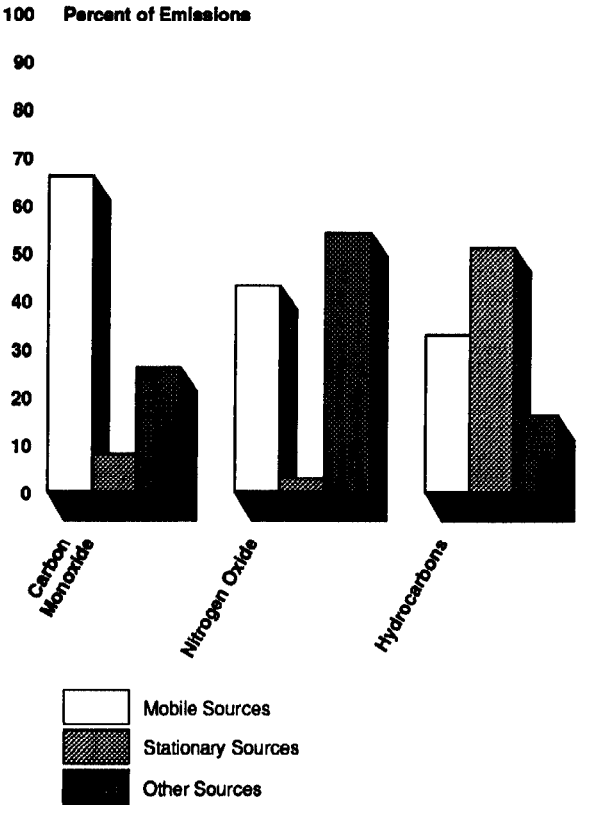


Source: GAO illustration based on EPA data.

Mobile sources, which include passenger cars, trucks, motorcycles, buses, locomotives, boats, aircraft, farm equipment, construction machinery, and recreational vehicles, are major producers of ozone and carbon monoxide. As shown in figure 1.2, EPA estimates that during

1987, emissions from mobile sources were responsible for over two-thirds of the carbon monoxide emissions, nearly one-half of the nitrogen oxide emissions, and one-third of the hydrocarbon emissions in the air.

Figure 1.2: U.S. Sources of Air Pollution



Source: EPA.

Although all mobile sources produce emissions that contribute to air pollution, passenger cars and light duty trucks (which we will refer to as motor vehicles in this report) are the major contributors of pollution. Consequently, over the past 2 decades, EPA has given pollution by motor vehicles the most attention. About 157 million motor vehicles—122 million cars and 35 million light duty trucks—were operated in the United States during calendar year 1988.

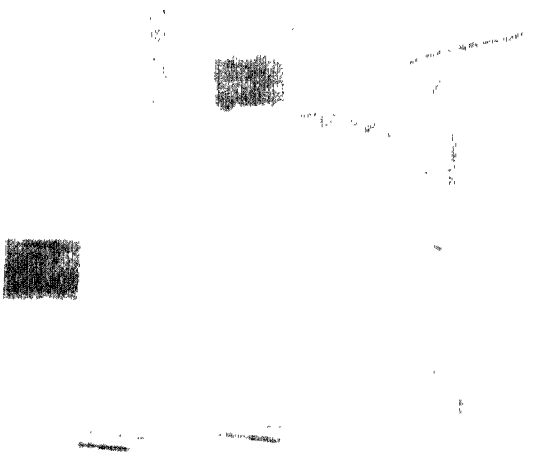
Clean Air Act Established Vehicle Emission Standards

Congress enacted the Clean Air Act to address the problem of air pollution. An important part of the act, as amended, is the recognition that motor vehicles are a major contributor to the problem. The act requires EPA to prescribe federal standards for the emission of air pollutants from motor vehicles for a specified period of time referred to as the "useful life" of the vehicles. The act currently defines the useful life of passenger cars as 5 years or 50,000 miles. As part of the Clean Air Act reauthorization, Congress is currently considering several proposed amendments that would establish more stringent emission standards for motor vehicles.

EPA Office of Mobile Sources Tests Vehicles

To carry out its responsibilities under the act, EPA established the Office of Mobile Sources (OMS) for regulating, testing, and monitoring emissions from motor vehicles. This office is responsible for certifying that motor vehicles sold in the United States meet federal emission standards throughout the various stages of their useful life. To do this, OMS established a testing program to determine if vehicles are meeting the federal standards. To confirm test data submitted by manufacturers, OMS conducts emission tests on vehicles from selected engine families, which are manufacturers' groupings of vehicles with common engine configurations. The testing procedure involves operating each vehicle on a dynamometer, a device that allows a vehicle to remain stationary while it is being driven much as it would be under normal use, as shown in figure 1.3. Emissions are collected from the vehicle's exhaust pipe and measured. The results are compared to the current exhaust emission standards.

Figure 1.3: A Vehicle on a Dynamometer



Source: EPA.

In addition to measuring vehicle exhaust emissions, OMS tests vehicles for emissions resulting from fuel evaporation. After a short drive, the vehicle is placed with the motor off in an enclosed chamber for a specified period. The hydrocarbon emissions released from the vehicle are measured and compared to the evaporative emission standard.

The purpose of OMS' testing program is to ensure that vehicles are designed to achieve emission standards, comply when they are produced, and remain in compliance throughout their useful life. To achieve its purpose, the program involves testing vehicles at different stages in the vehicles' life. In its testing program, OMS tests prototype and production vehicles before they have been driven by the public, and it tests in-use vehicles after they have been driven by the public for 2 to 3 years:

- Prototype vehicles are tested under OMS' Certification Program before the manufacturer begins producing them, to determine if engine families, as designed, can meet the emission standards. Manufacturers test 100 percent of the engine families they produce and provide the test data to OMS. As a quality assurance check, OMS retests some of the vehicles to confirm the manufacturers' test results. Engines must meet the standards, or they have to be redesigned until they do.

- Production vehicles off the assembly line are tested under OMS' Selective Enforcement Audit Program, to ensure that approved designs are successfully translated into production and that quality control on the assembly line reasonably guarantees compliance with the emission standards by vehicles in use. As a check on manufacturers' quality control procedures, OMS officials visit assembly plants and select a sample of vehicles for manufacturers to test on site. Most auto manufacturers routinely conduct their own emission testing on production vehicles and provide the test results to OMS.
- In-use vehicles are tested under OMS' Recall Program, to determine how well emission control devices are holding up over time. OMS provides small incentives—such as a free tank of gas and an engine tune-up—to vehicle owners in exchange for allowing OMS to test their vehicles. The process involves testing six properly maintained vehicles from an engine family.[1] If the average emissions from these vehicles exceed the standards, then OMS tests an additional 10 vehicles from the same family to confirm the results.

If OMS determines that an engine family fails to meet the emission standards under any of its three programs, it has broad powers to ensure that these vehicles are brought into compliance. If an engine family fails to meet the emission standards during prototype or production testing, OMS can prevent the auto manufacturer from selling the vehicles. If an engine family fails the in-use tests, OMS can require the manufacturer to recall and repair the vehicles.

OMS also has an important role in ensuring that states adequately monitor and control motor vehicle emissions. A 1977 amendment to the Clean Air Act established a December 1982 deadline for states to meet the NAAQS for ozone and carbon monoxide. As the deadline approached, it became apparent that most states had not been able to implement sufficient actions to enable them to meet the standards. Those states that could not meet the standards were granted an extension until December 1987. However, the amendment required states receiving the extension to implement a vehicle inspection and maintenance (I/M) program. EPA limits the requirement to designated non-attainment areas with populations of 200,000 or more.

An I/M program has two primary functions: (1) to identify vehicles producing excessive emissions and (2) to require the necessary maintenance or repair to bring these vehicles into compliance. Under the program,

[1] Vehicles must be maintained according to the terms of the manufacturer's warranty.

motorists are required to have their vehicles' emission control systems tested periodically by a trained inspector. The procedure generally involves placing an instrument inside the tailpipe while a vehicle is idling. The instrument is connected to a computerized analyzer that measures the vehicle's emissions. The standards against which the test results are measured can vary with each program, depending upon an area's need to improve air quality. If the vehicle fails, it must be repaired and retested. OMS can monitor the compliance and effectiveness of I/M programs by (1) auditing them and examining operating data submitted by the states and (2) measuring the overall emission reductions being achieved by the programs.

Objectives, Scope, and Methodology

The Chairman, Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, requested that we examine the effectiveness of OMS' operations in regulating and controlling air pollution resulting from motor vehicles. Specifically, the Chairman was concerned that OMS' enforcement programs, involving the inspection, surveillance, and testing of new and in-use vehicles, may not be adequate or effective.

In meetings with the Chairman's office, we subsequently agreed to review EPA's programs that

- test vehicle emissions to identify vehicles exceeding emission standards,
- ensure the return to compliance of those vehicles exceeding the standards, and
- monitor state and local I/M programs designed to identify for repair those vehicles producing excessive emissions.

Our work was conducted primarily at OMS' Motor Vehicle Emissions Laboratory, in Ann Arbor, Michigan, and at EPA headquarters, in Washington, D.C. We visited EPA Region V, Chicago, Illinois, and EPA Region VI, Dallas, Texas, to assess the data provided by states under their jurisdiction. We also visited the California Air Resources Board, in El Monte, California, to review its vehicle emission testing programs.[2] In addition, we reviewed reports and studies to obtain the most current information on OMS' motor vehicle emission control program, on OMS' strategies to

[2]The California Air Resources Board is a state air pollution control agency. The functions and operations of its Mobile Source Division, including its vehicle testing activities, largely parallel those of EPA's Office of Mobile Sources.

control motor vehicle emissions, and on trends in air quality. We also reviewed legislation that could affect our findings.

To determine OMS' effectiveness in assessing emissions from motor vehicles at various stages in their life cycle, we interviewed OMS officials at the Ann Arbor facility and Washington headquarters. We also spoke with representatives from automotive companies to solicit their views on OMS' testing efforts. We interviewed representatives of trade and interest groups, including the Motor Vehicle Manufacturers Association, the American Lung Association, and the American Automobile Association. Further, we discussed OMS' federal vehicle emission control program with officials from the California Air Resources Board.

We also reviewed OMS' production testing data to assess the adequacy of the coverage provided. We analyzed OMS' in-use vehicle testing data to determine the extent of noncompliance for vehicles of model years 1981 through 1986 (the most current for which data were available). We then divided the test results for model year 1986 into four quarters to determine if the noncompliance rates for vehicles in the last quarter (lower priority targeted vehicles) were comparable to those for vehicles in the first quarter (higher priority targeted vehicles).

To determine how effective OMS has been in ensuring that noncomplying motor vehicles are brought back to compliance, we discussed OMS' enforcement actions with officials from OMS and each of the three domestic auto manufacturers. With California Air Resources Board officials, we also discussed a pilot project of the board and Chrysler's to increase recall response rates, and we reviewed the preliminary results. In addition, we reviewed OMS' recall reports for 1985 through 1987 to determine the number of vehicles recalled due to emission system violations that were ultimately repaired. We chose this time period so that auto owners would have had at least 2 years to respond to the recall.

To determine how well OMS has monitored I/M programs to ensure that they are meeting program objectives, we spoke with OMS officials at the Ann Arbor facility and at EPA's Chicago and Dallas regional offices. We reviewed OMS files to determine the frequency of the Office's I/M audits and its efforts to measure the programs' effectiveness. We also reviewed, summarized, and documented OMS' inventory of I/M operating data to determine the extent to which the Office had obtained information necessary to monitor I/M programs' compliance and effectiveness. We obtained data from the period January 1987 through June 1989 for the 37 I/M programs that had been in operation for at least 1 year at the

time of our review. We chose this period because it was during this time frame that EPA began requesting states with I/M programs to submit specific program operating data. Also, because reporting cycles can vary from program to program, we obtained data from a period that would allow us to review several cycles for each program. Furthermore, this approach allowed us to review the most recent reporting data for each program.

We sought the views of EPA officials, who generally agreed with the factual information discussed in this report, and we incorporated their comments where appropriate. However, as requested, we did not obtain official agency comments from EPA on a draft of this report. We conducted our review from February through October, 1989, in accordance with generally accepted government auditing standards.

Inadequate Forecasting and Monitoring Inhibit Vehicle Emission Control

Under the Clean Air Act, EPA is responsible for determining that motor vehicles are capable of meeting federal emission standards throughout their useful life. The act authorizes EPA to test vehicles at two stages to determine if they conform to standards. First, the act requires EPA to obtain and review emission test data on new vehicles before they are sold, to determine if they are designed to meet the standards once they are on the road. Second, the act authorizes EPA to test vehicles that have been sold to consumers and used on the road to determine if the vehicles in use actually meet the emission standards. These testing activities have two objectives: (1) to prevent the sale of vehicles that would be excessive polluters and (2) to identify for repair those already sold that are exceeding the standards.

However, OMS' vehicle testing programs are not adequately meeting these objectives:

- OMS' procedure for forecasting the emissions of vehicles before they are sold to the public includes a deterioration rate that does not reflect actual on-road use. Consequently, although all vehicles sold have been certified as capable of meeting the standards over their useful life, since 1981 about 75 percent of the in-use vehicles subsequently tested by OMS have failed to meet emission standards.
- OMS' testing of vehicles after they are sold to the public does not provide adequate coverage of the vehicle fleet. Despite a continuing high failure rate of in-use vehicles, OMS has reduced its testing of these vehicles because of resource constraints, and now only tests a sample representing one-third of the model year fleet. As a result, OMS does not know if the remaining two-thirds of the in-use vehicle fleet is complying with federal emission standards.

Proposed Clean Air Act reauthorization legislation to make emission standards more stringent and extend the useful life of vehicles could put an even greater demand on OMS' testing resources.

OMS' Forecasts of Vehicles' Compliance With Emission Standards Have Not Been Accurate

Section 206 of the Clean Air Act requires OMS to ensure that new vehicles conform to emission standards and issue a certificate of conformity to all complying vehicles. In order to provide this certification, OMS tests prototype vehicles to forecast emissions over vehicles' useful life. OMS develops its emission forecast by a two-step process. First, OMS obtains emission test data on prototype vehicles either through its own or the manufacturers' testing. All manufacturers are required to provide emission test data, and OMS conducts its own testing on a limited number of prototype vehicles to verify data supplied by manufacturers.

Second, recognizing that emission systems do not perform at the same level throughout the useful life of vehicles, OMS also requires manufacturers to develop deterioration rates to project what emission levels will be once the vehicles are in use. Each engine family has a specified deterioration rate determined by manufacturers according to an OMS-approved procedure. For passenger cars, manufacturers are required to test three vehicles of every engine family certified—two to obtain data on emissions and one to obtain data on durability.

OMS' past forecasts of conformance to emission standards, however, have not been accurate for either passenger cars or light duty trucks. Although all vehicles sold have been certified by OMS as conforming to the standards, OMS' testing of in-use vehicles shows that most of the vehicles tested after being sold to consumers and used on the road do not meet all of the federal emission standards. Since 1981, about 75 percent of the in-use vehicles tested have not achieved the federal emission standards. Most recently, about 67 percent of the in-use passenger cars and 70 percent of the in-use light duty trucks tested by OMS in 1988 failed to meet at least one of the standards.

While some vehicles failed by relatively small amounts, most vehicles failed to meet the standards by significant amounts. For example, of the 140 in-use vehicles tested in 1988, 70 failed to meet the emission standard for carbon monoxide, and half of these failing vehicles emitted carbon monoxide at levels 54 percent greater than the federal standard. The results of OMS' 1988 emission testing—which was conducted on model year 1986 vehicles—are shown in table 2.1.

Table 2.1: In-Use Test Failures for Model Year 1986 Vehicles

Pollutant standard	Number of test failures[a]	Percent of excess emissions for test failures[b]
Carbon monoxide	70	54
Hydrocarbon	40	35
Nitrogen oxide	18	45
Evaporative hydrocarbon	28	103

[a]Some of the 140 vehicles tested failed to meet more than one of the standards.

[b]We used the median value—rather than the average value—of excess emissions from the failed vehicles to lessen the effect of extreme cases.

In our review of OMS' in-use vehicle data base, we found examples of vehicles that exceeded the emission standards by significant margins. For example, we found one engine family—representing 302,000 vehicles—that exceeded the carbon monoxide standard by more than 14 times. Another family of over 127,000 vehicles exceeded the standard by nearly 6 times.

Procedure for Determining Deterioration Rate Does Not Reflect On-Road Use

During certification, OMS' forecasts of emission system performance have not been accurate because the Office's procedure for developing deterioration rates does not reflect the actual deterioration that occurs in use. OMS requires manufacturers to calculate an emission system deterioration rate using test results from a prototype vehicle—sometimes virtually handbuilt—that has accumulated 50,000 miles on a dynamometer located outside of a building. This deterioration rate is then applied to the test results of two emission test vehicles—which are production vehicles from the same engine family—that have been driven 4,000 miles, in order to project the emission levels of these vehicles at 50,000 miles. If these projected emission levels are lower than the federal emission standards, OMS certifies the engine family will conform with the standards in use.

However, because manufacturers test prototype vehicles for durability on dynamometers for a brief period, vehicles are not subjected to key factors causing emission systems to deteriorate, including numerous engine starts, numerous short trips with a cold engine, weather extremes, rough terrain, and aging. As a result, most vehicles are projected to have a low rate of emission system deterioration. According to OMS data on 1984-86 model year passenger cars, the emission systems of most engine families were projected to deteriorate by about 50 percent

over the useful life of the vehicles, and some were projected to not deteriorate at all. However, we found that after the vehicles were used by the public, the actual deterioration rates were considerably higher than the projected rates. For example, OMS projected that carbon monoxide emissions would increase by 13 percent over the vehicles' useful life. However, OMS data on vehicles tested after consumer use showed that carbon monoxide emissions actually increased by 122 percent.

This problem with how OMS develops deterioration rates has been cited in a 1988 study conducted for the Northeast States for Coordinated Air Use Management (NESCAUM).[1] According to the study, OMS' prototype testing process measures vehicle emissions in an artificial environment (very carefully maintained vehicles are tested under perfect driving conditions, operated by well-trained drivers on ideal roads or dynamometers). As a result, the study concluded that ". . . one cannot say with confidence that cars that pass certification will inevitably perform well in use."

Both auto manufacturers and OMS officials we spoke with agreed that certification testing does not indicate how well a vehicle's emission system will perform in use. They differ, however, on the reason why. Auto manufacturers believe that the reason in-use vehicles fail to meet emission standards is inadequate maintenance by owners. Manufacturers said that the public generally does not follow proper maintenance procedures, particularly regarding emission equipment. According to the manufacturers, the public is not especially concerned about maintaining this equipment at the proper specifications unless not maintaining it will affect driveability (e.g., by causing slow starting or rough idling). They added that although OMS attempts to select only well-maintained vehicles for in-use testing, determining if the emission control equipment has been properly maintained is very difficult, unless the catalytic converter is removed and taken apart.

OMS officials, however, disagree with this position. They believe that poor design is the primary reason in-use vehicles do not continue to meet emission standards. They said their testing of failed vehicles has usually identified a problem attributable to the workmanship or design of the pollution control equipment, which is the responsibility of the manufacturer. OMS' Recall Branch Chief added that although improper vehicle

[1]Critical Analysis of the Federal Motor Vehicle Control Program, Northeast States for Coordinated Air Use Management, July 1988. NESCAUM is a coalition of eight states: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

maintenance contributes to excess emissions, improperly maintained vehicles are not a factor in OMS' in-use testing because OMS' selection procedures require inspection of the vehicles and documentation showing that proper maintenance was conducted, thereby screening such vehicles from the test sample. They added that representatives of the manufacturers are involved in the inspections and that any vehicle OMS or the manufacturers believe has not been maintained properly is not selected for in-use testing.

An August 1989 study by the California Air Resources Board also attributes much of the problem of in-use noncompliance to manufacturers.[2] The study attributes 50 percent of the excess emissions from all noncomplying in-use vehicles to poor design and manufacture. It attributes the remaining excess emissions to other factors, such as improper maintenance, tampering, and abuse.

OMS officials acknowledged that they need to do a better job forecasting emission system performance for vehicles in use. The branch chief responsible for developing procedures for calculating deterioration rates told us that the rates need to be made more realistic by accounting for the conditions emission systems are subject to in use. OMS officials suggested two possible solutions: (1) Deterioration rates could be modified to include data from actual in-use vehicles tested by OMS, and/or (2) prototype vehicles could be equipped with emission system components that have been artificially aged to reflect actual driving conditions. However, OMS officials added that because of limited resources, they currently have no plans to change the procedure for forecasting emission system performance based on prototype data. They said additional resources would be needed to study and develop alternative methods and/or procedures for calculating deterioration rates and for promulgating new regulations to implement any new procedures.

Testing Reductions Hamper OMS' Ability to Monitor In-Use Vehicles

To ensure that all vehicles meet emission standards throughout their useful life, OMS tests vehicles at various stages in their life cycle. However, because of budget constraints, OMS officials said they have had to cut back their testing, most notably of in-use vehicles. To compensate, OMS uses a sampling approach that targets its testing resources on vehicles it suspects exceed the emission standards. Nevertheless, under the current approach, it does not test samples representing nearly two-

[2] Assessment of the Current In-Use Recall Program and a Proposed Plan to Improve Its Effectiveness, State of California Air Resources Board (August 1989).

thirds of the model year fleet, and it has no way of knowing for certain whether these vehicles comply with the emission standards.

Limited Information Is Available for Assessing In-Use Emission Levels

Between 1981 and 1988, OMS' budget increased slightly in actual dollars, from $21.3 million to $22.6 million. However, in constant dollars,[3] OMS' budget was actually reduced by about 18 percent. At the same time, added responsibilities, such as having to monitor and control emissions from heavy duty motor vehicles, placed further demands on OMS' resources. To compensate, OMS reduced its vehicle testing programs in all three phases—prototype, production, and in-use—by 25 percent, 62 percent, and 57 percent, respectively, between 1981 and 1988.[4]

These reductions did not significantly affect OMS' ability to monitor the emission system performance of prototype and production vehicles. In the case of prototype vehicles, OMS requires auto manufacturers to submit test data that document emission system performance for vehicles of all engine families intended for sale during the coming model year. Manufacturers are not required by federal regulation to conduct their own production testing. However, most manufacturers do. Collectively, auto manufacturers conduct emission tests on thousands of vehicles and provide the data to OMS. For model year 1988, manufacturers provided 100 percent of the prototype vehicle test data and about 93 percent of the production vehicle test data OMS needed to assess emission system performance. OMS conducts limited testing to confirm manufacturers' data.

In contrast, OMS has limited information to assess in-use vehicle emission system performance. OMS does not have manufacturers' test data on in-use vehicles to supplement its own test data. Federal regulations do not require auto manufacturers to conduct in-use testing of properly maintained vehicles, and auto manufacturers we spoke with informed us that they generally do not do so. Manufacturers said they are reluctant to do such testing because OMS could require them to submit the test data and could use the data to order a motor vehicle recall.

Because OMS has reduced its testing of in-use vehicles, it has limited the amount of information it has to assess in-use vehicle emissions. From

[3]Constant dollars reflect actual 1981 dollars adjusted for inflation.

[4]Data for prototype and production testing were available on a fiscal year and calendar year basis, respectively.

1981 to 1988, OMS reduced its testing of in-use vehicles by 57 percent, from 322 vehicles in 1981 to 140 vehicles in 1988.

In-Use Testing Level May Not Be Adequate

Although the Clean Air Act requires OMS to ensure that manufacturers produce vehicles that throughout their useful life continue to meet the federal emission standards, OMS lacks emission information on most of the in-use vehicles to assess their compliance. OMS' testing level for 1988 provided emission data on 37 percent of the in-use vehicles. In prior years, OMS' testing of in-use vehicles generated emission data on as much as 64 percent of the in-use vehicle fleet. Consequently, OMS' current coverage of the emission system performance of in-use vehicles may not be adequate.

OMS officials agreed that by testing fewer vehicles, they are generating less information with which to assess emission system performance. However, they believe the current level of in-use testing is adequate because OMS' "targeting," or testing of vehicles suspected of noncompliance, identifies most of the noncomplying vehicles. According to the officials, more testing would not identify a significantly greater number of vehicles failing the emission standards. OMS officials could not provide us documented evidence to support this position but added that their position is based on their knowledge and experience in identifying vehicles that fail emission standards.

However, our analysis of OMS' testing levels and the vehicle failure rates indicates that the level of in-use noncompliance could be significant for those vehicles not represented in OMS' targeted sample. Therefore, testing reductions may not have been justified. The following conditions support this position:

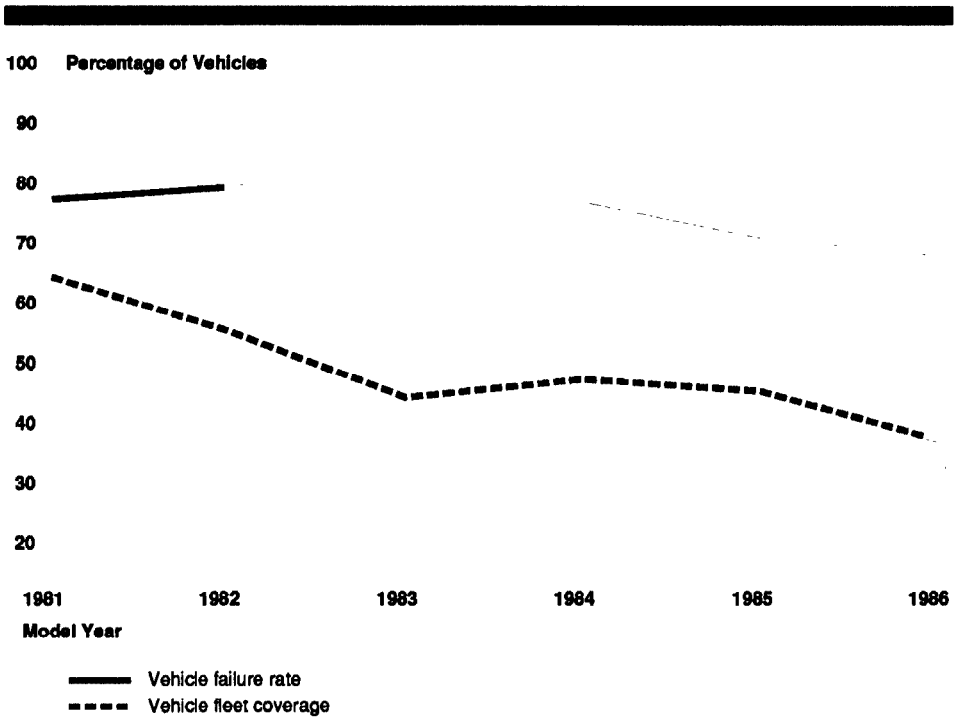
- Historically, OMS has found a higher percentage of noncomplying vehicles when it has conducted more testing.
- Vehicles OMS identified as being less likely to exceed emission standards (i.e., those ranked lower on OMS' testing priority list) are failing at a high rate.

High Failure Rates Do Not Justify Decreased Testing

For model year 1986 (the most recent model year for which testing was completed at the time of our review), when fleet coverage declined to 37 percent, 68 percent of the in-use vehicles failed to meet one or more of the emission standards. However, in prior years, when OMS' in-use testing provided greater coverage of the in-use vehicle fleet, the percentages of vehicles that failed to meet emission standards were comparable

to that for model year 1986. For example, for model year 1981, when fleet coverage was 64 percent, OMS determined that 77 percent of the in-use vehicles tested failed to meet the emission standards. If over the years OMS had been finding a significant decline in the vehicle failure rate, its reduction of in-use testing would be more justifiable, but such is not the case, as shown in figure 2.1.

Figure 2.1: Comparison of Failure Rate and Fleet Coverage of In-Use Vehicles, Model Years 1981 to 1986



The California Air Resources Board recently proposed increases in its in-use testing levels based on the percentage of vehicles that have exceeded emission standards. In 1988 the board was testing a sample representing about 42 percent of the in-use vehicles, finding a failure rate of 54 percent. However, the board has subsequently recommended increasing its testing levels to cover 51 percent of the in-use vehicle population. As justification for increasing its in-use testing level, the board cited the high failure rate as well as an indication that most manufacturers produce one or more engine families with emission systems that lack durability for 5 years or 50,000 miles.

Noncompliance Is High for All Targeted Vehicles

Under OMS' "targeting" approach, designed to make effective use of testing resources, OMS prepares a list, based on prior years' test data and information from other programs, of vehicles to procure for testing that it suspects may be exceeding the emission standards. The list is generally ranked in descending order, with the suspected worst violators first on the list. Beginning at the head of the list and continuing until resources run out, OMS tests as many of the targeted vehicles as possible. OMS officials believe that this approach identifies most of the noncomplying vehicles. However, the Chief of OMS' Recall Branch agreed that if the Office were given more resources for testing, it probably could identify more noncomplying vehicles, although he was unable to estimate how many.

Our analysis of OMS' in-use data base, however, indicates that in-use noncompliance could extend beyond those vehicles tested by OMS. We believe failure rates should begin to drop off dramatically near the end of the targeted sample to indicate that most of the noncomplying vehicles have been identified. We did not find this trend in our analysis of test results for vehicles of the 1986 model year. We divided the emission test results into quarters to compare failure rates for those targeted vehicles most likely to exceed emission standards and those targeted vehicles least likely to exceed the standards. We found that targeted vehicles in the fourth quarter, those least likely to fail, had a failure rate of 58 percent, almost the same as the 60 percent failure rate for vehicles in the second quarter. While the failure rate for vehicles in the fourth quarter was not as high as the 83 percent rate for vehicles in the first quarter, we believe a failure rate of 58 percent is high enough to raise concerns about the adequacy of the testing level.

OMS Needs Information on Nontargeted Vehicles to Adequately Monitor In-Use Compliance

Despite the conditions discussed above, OMS maintains its position that current testing levels are adequate and that most of the noncomplying vehicles are being identified. However, it does not know for certain whether it has identified most of the in-use vehicles of engine families that do not comply with the emission standards without more information on that part of the fleet it did not test. Testing a statistical sample of those remaining vehicles not targeted would give OMS information on how effective its targeting approach had been. Also, doing so would provide OMS with information on where it should focus its testing resources in the future.

Moreover, OMS has weakened its ability to deter further noncompliance. Auto manufacturers informed us that the real impact of in-use testing

and a subsequent recall is the bad publicity it generates for them. The public are less likely to purchase a motor vehicle from an auto manufacturer if they continually see the manufacturer's vehicles recalled. If the current testing coverage is to continue, OMS is in effect holding auto manufacturers accountable for only approximately one-third of the most recent model year fleet. A statistical sample of the remaining, nontargeted vehicles would extend the threat of a recall to the entire model year fleet. However, a statistical sample component complementing OMS' targeting approach would most likely require added testing resources, especially if the sample shows that additional testing is warranted.

Proposed Legislation Could Affect Testing Programs

The demand on OMS' testing resources could be even greater if proposals to amend the Clean Air Act are enacted. Proposed legislation to amend the Clean Air Act currently being considered could significantly change the emission standards vehicles must meet. For example, two changes proposed for passenger cars could have a significant impact on OMS' testing programs:

- lowering the emission standards from .41 to .31 grams per mile for hydrocarbons and from 1.0 to .40 grams per mile for nitrogen oxide (carbon monoxide emissions would remain at the current level of 3.4 grams per mile), and
- extending the period of time for which a passenger car must meet the emission standards, referred to as a vehicle's "useful life," from 5 years or 50,000 miles to 10 years or 100,000 miles.

The proposed legislation also contains provisions to require manufacturers to pay the cost of in-use testing, which could provide resources to increase the testing done under the programs.

Lowering Emission Standards

Auto manufacturers believe that lower emission standards would be more difficult for them to achieve initially for prototype and production vehicles and certainly for in-use vehicles. According to OMS officials, if emission standards are lowered, OMS would have to do a better job of forecasting the compliance of vehicles once they would be in use by customers. Also, OMS conceivably would have to do more testing, at least in the early years, to substantiate that the auto manufacturers are designing and selling vehicles that meet the tighter standards.

An OMS official in charge of prototype testing informed us that given cited budget constraints, his section would probably try to do a better job of targeting rather than conduct additional testing. This targeting would involve screening auto manufacturers' test data and selecting for confirmatory testing those vehicles that just barely met the standards or that have new, untested emission control technology.

In the opinion of an OMS official responsible for the in-use testing program, auto companies have already demonstrated with those vehicles sold in California, where emission standards are similar to those proposed nationally, that they can design and build vehicles to meet stricter standards.[5] Consequently, the official does not believe manufacturers will have any more difficulty meeting the standards than they have already. California Air Resource Board officials, however, informed us that they also are detecting a high rate of noncompliance by in-use vehicles. For the model year 1986 (the most recent model year for which information was available), 54 percent of the vehicles tested by the board exceeded the California emission standards.

Extending Vehicle Useful Life

Auto manufacturers also believe that extending the useful life of passenger cars could make it more difficult for their vehicles to meet in-use emission standards. They believe that failure on the part of auto owners to maintain their vehicles properly is already a major reason why these vehicles are failing in-use emission tests. According to auto manufacturers, auto owners are even less likely to maintain their vehicles properly as the vehicles get older.

Extending the useful life of passenger cars beyond 5 years or 50,000 miles conceivably could dilute OMS' resources even more than they have been, as OMS would have a larger span of years/miles to monitor. For example, as of July 1, 1988, there were about 122 million passenger cars on the road. Of these, about 48 million were still required to meet the current federal emission standards. If the proposed standard of 10 years of useful life for passenger cars is applied to this universe of nearly 122 million vehicles, OMS would instead be responsible for monitoring the emissions from about 94 million vehicles. Light duty trucks would not be affected by this proposed legislation because they currently have a useful life of 10 years.

[5]The eight northeastern states that formed NESCAUM are also in the process of adopting the California emission standards.

The Chief of OMS' Recall Branch anticipated that obtaining high mileage vehicles suitable for testing would be difficult and costly. OMS would have to screen more vehicles to find those that have been properly maintained. If OMS could not demonstrate that these vehicles have been properly maintained, auto manufacturers could successfully dispute the test results.

Requiring Manufacturers to Pay for In-Use Testing

Proposed legislation in both the Senate and the House of Representatives would provide OMS with the authority to impose user fees that would require manufacturers to pay the cost of in-use vehicle testing. For example, according to a Senate bill, the Administrator may require the manufacturer of those in-use vehicles that the Administrator believes may not conform to regulations to pay the costs incurred in procuring and testing such vehicles or engines.

OMS officials stated that they support the concept of user fees. They said that a user fee provision requiring that fees go directly to OMS for use in vehicle testing, which the proposed legislation would do, would enable them to fund more testing and better ensure that the vehicle fleet is meeting the mandated emission standards. OMS officials pointed out that under the general authority of the Independent Offices Appropriation Act of 1952 (31 U.S.C. 9701), commonly referred to as the "User Charge Statute," they already could impose fees for specific services, goods, or things of value that are provided to identifiable beneficiaries and that do not primarily benefit the general public. However, under the statute, fees collected must be deposited in the Treasury as miscellaneous receipts and therefore could not be used by OMS to fund agency programs directly. Because of this, OMS officials said they have not previously imposed user fees for emission testing activities.

The imposition of user fees appears to be justified on the basis that auto manufacturers are identifiable beneficiaries of the testing program. For example, about one-third of the in-use testing information generated for model year 1986 could be used by auto manufacturers to help rectify problems with their emission control systems. Further, it is reasonable to expect manufacturers to help fund the cost of testing activities designed to ensure they meet federal emission standards since it is the responsibility of the manufacturers—not OMS—to comply with these standards.

User fees for vehicle testing are used at the state level. The California Air Resources Board currently charges auto manufacturers user fees for

all of its emission testing programs. The authority to charge user fees to manufacturers is granted by California's Clean Air Act. In 1988 the board collected about $4.5 million from fees charged to manufacturers for vehicle certification.

Conclusions

Recognizing the contribution of motor vehicles to the nation's air pollution problem, the Clean Air Act has sought to reduce motor vehicle emissions by requiring the establishment of emission standards that the vehicles must meet throughout their useful life. The act made EPA responsible for ensuring that the vehicles meet these standards. In this regard, the act authorizes EPA to test vehicles or require that they be tested before and after they are sold, to determine that the vehicles meet and will continue to meet emission standards throughout their useful life.

The efforts of EPA's Office of Mobile Sources to carry out these testing activities, however, have not been adequate in both areas. OMS has not developed an effective procedure for identifying, before vehicles are sold to the public, those that in use will fail emission standards. Consequently, many vehicles certified by OMS as capable of meeting emission standards throughout their useful life actually emit excess pollutants once they are in use. For the most recent model year tested, the failure rate for vehicles sold to and used by the public was 68 percent, a high failure rate in view of current air pollution problems and the objectives of the Clean Air Act.

OMS is also not conducting sufficient testing of in-use vehicles to ensure it is identifying those that are failing to meet the standards. Since 1981 OMS has reduced its level of in-use testing by more than one-half to the point where the information only accounts for one-third of the vehicle fleet on the road. With its limited testing, OMS finds that most vehicles do not meet the federal standards. However, it lacks emission system performance data to assess the compliance of nearly two-thirds of the in-use fleet, the portion not represented in its testing.

OMS' current procedure for determining emission system deterioration rates over vehicles' useful life does not reflect actual on-road use and consequently does not accurately forecast the deterioration that will occur in emission system performance. We recognize that it may not be possible to determine the actual deterioration rate for each vehicle before it is produced and sold to the public. To account for the differences between the calculated and actual deterioration rates, OMS could

use historical data, which show that deterioration rates based on the current procedure are not accurate, to develop an adjustment factor to add to its current procedure. Such an adjustment factor could result in better forecasts of the emission system performance of vehicles on the road.

OMS' current targeting approach is a realistic use of scarce testing resources. However, OMS is not testing vehicles other than those targeted to ensure that nontargeted vehicles are not emitting excess pollutants and to verify that its targeting process is accurate. The current level of testing—covering for model year 1986 only one-third of the fleet—may not be justified in light of the 68 percent failure rate that is occurring among the vehicles tested.

Additional testing will, however, require additional resources. The most likely source is a user fee to be paid by the manufacturers. We believe such a fee can be justified because (1) OMS provides data to manufacturers on the causes of emission system problems and solutions to return the vehicles to compliance and (2) the testing activities have the sole purpose of ensuring that manufacturers fulfill their responsibility to produce vehicles that comply with federal emission standards. A fee for each car tested—whether or not it fails—would spread the burden equally among manufacturers and could provide the needed resources.

We realize that some disagreement may exist over the need to revise the procedure for calculating deterioration rates and to conduct additional in-use testing and over how to pay for any changes. In particular, vehicle manufacturers may believe that greater deterioration rates may make it more difficult for their vehicles to pass certification and may result in higher costs to develop emission control equipment. However, in our opinion, changes to improve the testing procedures may have three significant benefits over the long term:

- Fewer in-use vehicles that fail to meet the standards will be sold to consumers, so air pollution would be reduced.
- In-use testing levels needed to ensure that noncomplying vehicles are identified could eventually decline as fewer vehicles that fail to meet the standards over their useful life are produced.
- Manufacturers' overall costs may be reduced as fewer vehicles would have to be recalled for emission system repairs.

The proposed changes to the Clean Air Act make the need for these revisions to OMS' testing programs even more critical. The proposed changes

will require manufacturers to produce vehicles that meet more stringent emission standards and will require the vehicles to meet the standards for a longer period of time. Consequently, both the deterioration of emission system performance and the ability of vehicles to meet the standards over their useful life will be of greater concern.

Recommendations to the Administrator, EPA

In order to better prevent the sale of vehicles that in use fail to meet emission standards, and to better identify those already sold, we recommend that the Administrator, EPA,

- change the method for determining deterioration rates of emission systems to include the use of actual data from in-use vehicles to provide more accurate forecasts of whether vehicles will meet emission standards throughout their useful life,
- change the testing of in-use vehicles to include a sample of nontargeted vehicles and thereby provide more comprehensive coverage of the in-use motor vehicle fleet, and
- determine the appropriate level of testing necessary to ensure noncomplying vehicles are identified and determine the resources needed to fund any additional testing.

Recommendation to the Congress

Currently proposed amendments to the Clean Air Act would provide EPA with the authority to recover a portion of its in-use testing costs by charging these costs to manufacturers. We endorse such a provision because (1) testing coverage has been curtailed due to resource limitations, (2) manufacturers are ultimately responsible for complying with emission standards, and (3) in-use vehicles fail at a high rate and need to be identified and repaired. We therefore recommend that the Congress include in final Clean Air Act legislation a user fee provision authorizing EPA to charge manufacturers for some or all of the testing costs.

Efforts to Recall In-Use Vehicles Have Not Been Effective

The primary goal of OMS' testing program is to ensure that vehicles sold to the public meet the federal emission standards throughout their useful life. If vehicles fail to meet the standards after being sold to the public, OMS is responsible for ensuring that auto manufacturers recall these vehicles and repair the emission systems. However, despite manufacturers' efforts, the public response to recalls has been poor: Less than one-half of all vehicles recalled for deficient emission systems are subsequently brought in for repairs. Although reasons for the poor response are not fully known, OMS and vehicle manufacturers believe that the public has no incentive to return vehicles for repair. Consequently, some improvement in air quality is lost since millions of noncomplying vehicles are still on the road.

OMS could pursue options to increase the public response rate to recalls. These options include tying recalls to state vehicle registration or inspection/maintenance programs and/or requiring manufacturers to meet a minimum recall response rate. OMS has not pursued these options primarily because it does not have the necessary legal authority.

Manufacturers Are Required to Recall In-Use Vehicles That Do Not Meet Standards

Vehicles that fail to meet emission standards during their useful life contribute to the nation's air pollution problem. According to the August 1989 California Air Resources Board report on the effectiveness of its in-use vehicle recall program, the excess emissions contributed by only one engine family with defective emission equipment can be staggering. The report cited the effects of one engine family that emitted hydrocarbons and carbon monoxide at levels 8 times the applicable standards. A group of selected engine families—representing in California 130,000 vehicles—produced emissions equal to those of 1 million complying vehicles. Our analysis of OMS' in-use testing program confirms the board's conclusion about the significance of noncompliance by the vehicles of even one engine family. For example, the 302,000 vehicles of a single engine family that exceeded the carbon monoxide standard by 14 times, as discussed in chapter 2, generated emissions equal to those of 4.2 million complying vehicles.

Because of the potential impact of noncomplying vehicles on air quality, the Clean Air Act requires manufacturers to recall in-use vehicles that fail emission tests. Section 207 of the Clean Air Act requires the Administrator to notify a manufacturer if a substantial number of any class or category of vehicles, although properly maintained and used, do not conform with emission standards. The manufacturer in turn is required

to submit a plan to OMS for repairing the vehicles, and the manufacturer, not the vehicle owners, must pay for the repairs.

Manufacturers also detect emission system problems through their own testing and have voluntarily requested the recall of some vehicles. Altogether, during calendar years 1985-87, 6.5 million vehicles were identified by manufacturers and OMS for recall because of emission system problems.

In a recall, manufacturers send notices through the mail to owners, requesting them to bring their vehicles to an authorized dealer for repair. Owners are informed that the repairs are at no cost to them. They are also advised to respond promptly to the notice or face the possibility that any subsequent repair would not be covered under the warranty. Generally, manufacturers send a follow-up letter to remind owners to bring their vehicles in for repair.

Public Response to Recall Notices Is Limited

Although repairs are performed at no cost to the owners, public response to recall notices has generally been inadequate. Less than one-half of the recalled vehicles are returned to an authorized dealer for repair. According to our review of information provided to OMS by vehicle manufacturers, only about 3.0 million, or 46 percent, of the 6.5 million vehicles that were recalled for emission system violations during calendar years 1985-87 were brought in for repair.

Both representatives of the manufacturers and OMS officials agree that this response rate to vehicle recall notices is unsatisfactory. They attributed the low response rate to several causes:

- Because emission system problems often do not affect driveability, owners see no reason to return their vehicles to a dealer. Also, owners may fail to respond if they believe that the driveability of their vehicles may be adversely affected by the repair.
- In some cases, as many as 10 percent of the vehicles are unavailable. A vehicle may be unavailable because it has been scrapped or destroyed, it has been resold and its owner is unknown to the manufacturer, or the owner has moved and cannot be located.
- Without a requirement to respond, many owners simply ignore the recall notice.

The response to emission system recalls is similar to that for safety recalls. The National Highway Traffic Safety Administration is responsible for requiring recalls of motor vehicles for defects that reduce safety. According to its Associate Administrator for Enforcement, the response rate to safety recalls has been approximately 54 percent.

Options Exist for Improving Response to Recalls of In-Use Vehicles

OMS officials acknowledge that there is a need to improve the current recall response rate. According to the OMS Recall Branch Chief, OMS is concerned about the low response rate because such a rate lessens the impact of the in-use testing program and the agency's efforts to ensure vehicles meet emission standards. The effort to identify noncomplying in-use vehicles is of little value, he pointed out, if owners will not bring their vehicles in for repair.

Some suggested options that OMS could pursue to improve the response rate to recall notices include

- requiring repairs before vehicles can be reregistered,
- requiring repairs as part of I/M programs, and
- requiring manufacturers to achieve specified recall response rates.

Requiring Repairs Before Reregistration

One method that could be pursued to improve the response to recalls is to require all owners of recalled vehicles to have the repair completed before the vehicles can be reregistered. This approach is currently being tested in California. To address the problem of poor public response to recalls in its state, the California Air Resources Board initiated a pilot project with the Department of Motor Vehicles and the Chrysler Corporation. Owners of recalled motor vehicles are required to show proof that their vehicles have been repaired before the vehicles can be reregistered with the state. California Air Resources Board officials believe the project has the potential to increase the recall response rate to about 90 percent.

OMS' Recall Branch Chief said that this option has widespread benefits, as it could apply to all recalled vehicles in the country. However, OMS officials have not suggested a program similar to California's because they believe states would be reluctant to participate unless the federal government would compensate them for any related expenses that would be incurred. Further, OMS' major concern is that this option could overburden vehicle owners. For instance, owners, under a deadline to get their vehicles reregistered, could be unfairly penalized by the state if

they could not get repairs done because manufacturers, under no additional requirements, have not adequately supplied dealers with parts.

Tying Recalls to Inspection/Maintenance Programs

Recalls could be tied to state and local I/M programs that require owners to have their vehicles' emissions tested periodically. Under this option, states with I/M programs could be required to have owners show as part of the I/M test that they have responded to a recall notice. Owners unable to demonstrate that they had the emission system repaired would not be allowed to pass the test.

According to OMS officials, this approach would have less of an impact than tying recalls to reregistration because it would only affect a limited number of vehicles. Assuming that the current nationwide recall response rate of about 50 percent would also apply to vehicles in I/M areas, OMS would only be able to affect the remaining 50 percent. At the same time, only about one-third of the vehicles on the road are currently covered under state I/M programs. Consequently, at best this approach would affect only one-sixth of all vehicles nationwide. However, the benefit of such an approach, as cited by OMS, is that it focuses on the areas that have the most severe air pollution problems, as I/M programs are only required in areas that do not meet ambient air quality standards.

Requiring Manufacturers to Achieve Minimum Recall Response Rates

A third option would involve putting more responsibility on the auto manufacturers to improve the recall response rate. Manufacturers would be required to continue taking actions to have vehicles brought in for repair until the manufacturers achieve the minimum response rate.

Auto manufacturers we interviewed were not in favor of this option because it would probably involve providing financial incentives to the public, which they believe could prove to be very costly for them. They added that this option may exacerbate the problem of getting owners to respond quickly to recall notices. According to manufacturers, once owners become aware that manufacturers may have to provide financial incentives, some owners will delay bringing their vehicles in for repair until the larger incentives are offered.

OMS Has Limited Authority to Improve Response to Recalls

Although OMS officials stated that the recall response rates have not been good and that all three options could improve the response rates, they pointed out, and officials from EPA's Office of General Counsel agreed, that OMS does not have the authority to require actions under the first and third options and that the agency's regulations would have to be amended to implement the second option.

- Requiring vehicles to be repaired before they can be reregistered is not authorized by the Clean Air Act, as the act prohibits EPA itself from requiring owners to submit their vehicles for inspection or repairs. Consequently, while EPA can encourage states to require owners of recalled vehicles to have the repair completed as a condition of registration, the agency cannot require states to do so.
- Requiring vehicles to be repaired before they can pass I/M programs is not currently a component of approved I/M programs, but could be under EPA's current authority. The Clean Air Act states that inspection of a vehicle for purposes of a recall is voluntary on the part of vehicle owners, except as may be provided by any state or local inspection program. Under this authority, EPA could amend its regulations to require states with I/M programs to include response to recalls as a program element.
- Requiring manufacturers to meet certain recall response rates is not specifically authorized in the Clean Air Act. The act provides that manufacturers must recall vehicles under specified conditions, but does not specify a required response rate that manufacturers must achieve.

OMS believes that it would be beneficial to pursue these options for increasing the recall response rate. The Chief of OMS' Recall Program said that OMS attempted to obtain the authority to require manufacturers to meet minimum recall response rates, requesting that such authority be included in the proposed Clean Air Act amendments, but its request was not adopted. The official added that at this time, OMS has no efforts underway to improve the response rate to recalls. He said that the Office is following the results of the California pilot project, which links recalls to reregistration, and may review other options in the future. However, he was unable to provide us with any timetable for when OMS may take action to increase recall response rates.

Conclusions

The testing of new and used vehicles is only the first step in ensuring vehicles meet emission standards. Once vehicles have been tested, the second and key step is to have those that fail the tests brought in to dealers for repair and returned to compliance with emission standards.

The repair rate for vehicles that do not meet emission standards, however, has not been adequate. The Clean Air Act provided a mechanism to recall noncomplying vehicles so that they are repaired without cost to the vehicle owners. Yet less than half of the noncomplying vehicles recalled are subsequently brought in for repair. As a result, some improvement in air quality is lost since many noncomplying vehicles are still on the road.

Although the reasons for the low response rate are not fully known, OMS and auto manufacturers believe that owners do not respond because of little incentive or no requirement to do so. However, options exist that could overcome these impediments. These options would either require owners to comply with a recall notice—as would be the case with tying recalls to state vehicle registration or inspection/maintenance programs—or would require manufacturers to meet minimum response rates, possibly by providing financial incentives to owners. OMS agrees that the current recall response rate is not satisfactory; however, primarily due to a lack of legislative authority, it has not aggressively pursued these options to increase the recall response rate.

In our opinion, the significance of the problem warrants that OMS pursue both the regulatory and legislative options necessary to improve the current low recall response rate. The poor response largely negates the benefits of OMS' in-use vehicle testing program since most of the noncomplying vehicles are not repaired as intended. Further, a primary objective of the Clean Air Act—to ensure that motor vehicles meet emission standards throughout their useful life—is not being achieved. Improving the recall response rate would enhance the effectiveness of the in-use testing program and help achieve the air quality goals envisioned under the act.

Recommendation

We recommend that the Administrator, EPA, select and implement options that would best increase recall response rates. If warranted, the Administrator should seek additional legislative authority to implement those options that are not currently within the Administrator's authority to implement.

OMS' Monitoring of Vehicle Inspection/ Maintenance Programs Is Inadequate

State inspection/maintenance programs were designed as one measure to help improve the air quality in metropolitan areas with populations of 200,000 or more that exceed national air quality standards. The programs identify vehicles emitting excess pollutants and require the maintenance or repair necessary to reduce the emissions of those vehicles and bring them into compliance with applicable emission standards. OMS is responsible for ensuring that the I/M programs comply with state plans to improve air quality and that they operate effectively.

However, OMS' efforts to ensure the compliance and effectiveness of state I/M programs have been limited. OMS lacks sufficient data to measure I/M programs' compliance because (1) many states are not providing comprehensive program data to the Office and (2) OMS does not audit programs frequently enough to obtain the needed data. Further, OMS does not routinely measure the effectiveness of all programs. As a result, OMS cannot ensure that all I/M programs are operating in compliance with their state plans and achieving the air quality benefits anticipated.

OMS Oversees I/M Programs

The Clean Air Act established provisions for states to reduce levels of air pollution from motor vehicles. To do this, the act required each state to develop an EPA-approved State Implementation Plan (SIP) for achieving air quality standards. Where a state had one or more air quality control regions with populations of 200,000 or more that did not meet the National Ambient Air Quality Standards, the act required the state to include in the SIP a schedule for implementing an I/M program. In these cases, the SIP also set out the I/M program specifications to which the state commits. As of August 31, 1989, 38 I/M programs operated in over 60 different urban areas. These I/M programs, and the affected urban areas, are listed in appendix I. Two more programs, affecting four more urban areas, are scheduled to begin operation within the next 2 years.

Approximately one-third of the nation's vehicles, or about 50 million vehicles, are subject to I/M programs, with most of the program expenses borne by both vehicle owners and local governments. EPA estimates that the annual inspection cost to motorists is about $500 million. Emission control system repairs required as a result of failing an emission test could cost a vehicle owner $100 or more. Further, some state and local governments individually spend over a million dollars annually for program administration.

OMS is responsible for assessing each program's compliance with the specific provisions of its SIP, with each SIP setting out the specifications to which the state commits for its I/M program. Specifications would include, for example, the vehicles by model year to be tested annually, the procedures to be followed to ensure that noncomplying vehicles are not operated on public roads, and the number of station audits to be conducted by the state. Once a state commits to operating an I/M program as specified in its approved SIP, the commitments have the force of federal law.

Additionally, OMS is responsible for assessing each program's effectiveness in reducing vehicle emissions. Each SIP specifies an overall performance commitment, called the minimum emission reduction requirement, that the program must meet. This reduction requirement is a measure of the program's effectiveness stated as a percentage reduction in vehicle emissions over what emission levels would be without an I/M program. The specifications of each program are designed so that a properly operating program will meet the minimum emission reduction requirement.

OMS Has Insufficient Data to Measure I/M Programs' Compliance

In order to measure programs' compliance with the provisions specified in their SIP, OMS needs current operating data from each I/M program. Depending on the structure of the individual program, this operating data can consist of up to 17 specific items. The specific data include key indicators of a program's performance, such as the number of vehicles tested, vehicles passing and failing emission tests, vehicles waived from test requirements, and audits of I/M facilities conducted by the state. OMS' program audit guidelines—used for conducting audits of state I/M programs—suggest that these data be provided to OMS on a biannual basis.

According to the I/M project manager, OMS obtains the information to evaluate program compliance by reviewing operating data submitted by the states (or in some cases, local agencies) that administer the programs. OMS can also obtain operating data as part of the periodic I/M program audit process. However, we found that states are not providing comprehensive data, and OMS does not audit programs frequently enough to offset this shortfall in data.

States Do Not Always Provide Comprehensive Operating Data

To monitor states' compliance with their implementation plan, OMS relies on states with I/M programs to provide program operating data. After reviewing the data obtained from 36 of the 38 programs in operation, we found that states are not always providing comprehensive operating data.[1] From January 1987 through June 1989, 21 of the programs provided 50 percent or less of the data required by the OMS audit guidelines. Nine of these programs provided less than 30 percent of the data, and two programs did not provide any data during the period. The remaining 15 programs provided more than 50 percent of the data, but only 1 of these programs provided 100 percent of the requested data. Often the data not provided are necessary in order to assess a program's compliance. Some specific examples follow.

- Four programs did not submit data pertaining to the number of monthly station audits conducted by the state. This auditing is an important program quality assurance activity that the state, in its SIP, commits to conduct.
- Six programs did not submit data concerning the failure rate for vehicles that failed initial testing, were repaired to the extent required by the specific program, and subsequently retested. In order for a program to achieve the emission reduction benefits it was designed to, failed vehicles that have not been waived from a program's requirements must be repaired to bring them into compliance. The retest failure rate indicates the success of the program in bringing failed vehicles back into compliance with emission requirements.
- Six programs did not provide data indicating the number of vehicles to be tested during a specific period of time. Without knowing this information, OMS cannot determine whether the number of vehicles actually tested was at or near the level to which the program committed in its SIP.

States Lack Specific Reporting Requirements

OMS has attempted to encourage states to provide specific program operating data; however, as indicated above, it has had limited success. According to I/M program officials, states do not always provide comprehensive operating data to OMS primarily because they are not specifically required to do so.

As required by SIPs, states must report annually to OMS information relating to the operation of their I/M programs. However, when most SIPs

[1]Two programs were excluded from the analysis. OMS is not collecting data from one program due to the program's severe operational problems, and another program had not been in operation for a full year at the time of our review.

were approved in 1982, OMS had not established a minimum requirement defining the specific data to be reported. OMS instead allowed states to define what information they should report. According to the I/M project manager, this was because OMS (1) was not yet certain of the data that would ultimately prove most beneficial to track and reasonable to obtain and (2) did not want to impose a reporting burden upon the states when the benefit was unclear.

Since about 1985, OMS' oversight of I/M programs has allowed it to determine the specific data needed to monitor the ongoing operation of I/M programs effectively. According to the I/M project manager, OMS has been requesting and encouraging states to provide this data since 1987. However, OMS has not formally required states to provide specific operating data as part of their SIP requirement. According to the I/M project manager, without additional legal authority, OMS could require states to provide specific operating data as part of their SIP. Moreover, the official believes that a specific reporting requirement should have been formally imposed during the mid-1980s, when it became clear to OMS which data were most critical for states to report. OMS also has a new I/M policy called "enhanced I/M," which includes a provision for states to submit specific operating data on a semiannual basis. However, OMS has decided to await the final reauthorization of the Clean Air Act before implementing more stringent reporting requirements. At the time our audit work was completed, legislative action on the Clean Air Act was ongoing.

Program Audits Are Not Timely Means of Obtaining Operating Data

OMS can also obtain program operating data during regular audits of I/M programs. However, we found that OMS audits are not a timely means of obtaining operating data. Although the data are needed every 6 months, OMS' goal is to conduct audits about every other year. The I/M project manager informed us that program audits are not done more frequently because they are very resource intensive. In fact, OMS has not been able to meet this 2-year timetable for audits. In our review of OMS' audit schedule and files of audits completed between September 1987 and August 1989, we found that during the 2-year period, OMS had audited only 18 of the 36 programs. Given the length of time between audits of I/M programs, we believe OMS would not be able to monitor programs effectively if it would rely on audits to obtain needed operating data. Consequently, OMS must rely on states to submit operating data to ensure that I/M programs are complying with their SIP.

OMS Has Not Assessed the Effectiveness of Many Programs

To determine if I/M programs are achieving the overall performance objectives specified in their SIP, OMS has a computer modeling procedure to measure the effectiveness of programs. According to I/M officials, operating data submitted by the states or obtained through audits are used as input to a computer model that estimates the actual emission reduction a program is achieving, which is then compared to a minimum emission reduction requirement committed to in the SIP.

According to the project manager, this effectiveness measurement procedure, which OMS terms a "shortfall analysis," is the only way OMS can ensure and document that most programs are meeting their reduction requirement. However, OMS does not routinely measure the effectiveness of all programs operating nationwide. As of August 31, 1989, OMS had not measured the effectiveness of 14 of the 37 I/M programs.[2]

According to the project manager, effectiveness measurements have not been conducted on all programs because of OMS' belief that such measurements have not been needed in all cases. Although OMS policy requires effectiveness measurements be conducted, it does not stipulate how often they should be done. The project manager explained that an effectiveness measurement is generally conducted as part of an audit, or whenever OMS believes a program may not be meeting its reduction requirement. Explaining why OMS believes that an effectiveness measurement is sometimes unnecessary, the official said that when a program is operating as designed, OMS presumes that the reduction requirement is being attained. Conversely, he added, if a program is encountering problems to such an extent that non-attainment of the emission reduction requirement is obvious, OMS believes that conducting an effectiveness measurement would be pointless. He added that conducting effectiveness measurements for certain types of I/M programs is very resource intensive. Consequently, with limited resources available, OMS has been reluctant to measure the effectiveness of these programs.

Importance of Effectiveness Measurement

OMS may be able to determine if certain programs are in compliance with their SIP without conducting an effectiveness measurement. However, for noncomplying programs OMS needs to quantify the extent to which they are not meeting their minimum emission reduction requirement so that EPA regional offices can determine and/or assess necessary corrective actions. Depending upon the degree to which the emission reduction

[2]One program was excluded from the analysis since it had not been operating for a full year at the time of our analysis.

requirement is not attained, OMS could request a correction as part of an audit recommendation, request a corrective action plan from the state's governor, or declare the state's SIP inadequate. According to an OMS branch chief, effectiveness measurements allow OMS to distinguish between programs performing very poorly and those performing marginally. Further, the results of one state's I/M effectiveness measurement can be compared to another state's results in order to convince state I/M program officials of the magnitude of operating problems.

Also, conducting regular effectiveness measurements would be consistent with the goals of EPA management and the conclusions of a recent GAO report. In our August 1988 management assessment of the EPA, we stated that it is important for the agency to manage its programs for measurable environmental results.[3] That is, in order to assess the effectiveness of its programs, EPA must correlate some measure of improvement to the environment to a specific program activity. The effectiveness measurement attempts to quantify the operating results of a program and measure its impact in terms of improvements in air quality. As such, we believe that at present it is the best means of correlating I/M program activities to environmental benefits.

Further, standards for internal controls in the federal government require that significant agency transactions and events be properly recorded.[4] Since reducing motor vehicle emissions is the central purpose of I/M programs, the attainment or non-attainment of a program's emission reduction requirement is a significant event that should be documented.

Finally, the importance of conducting effectiveness measurements is supported by OMS in its proposed enhanced I/M policy, which would require that states conduct the analysis to ensure SIP commitments are being met. However, as mentioned earlier, the agency has chosen not to implement the policy pending the reauthorization of the Clean Air Act.

[3]Environmental Protection Agency: Protecting Human Health and the Environment Through Improved Management (GAO/RCED-88-101, Aug. 16, 1988).

[4]Internal controls that federal agencies are required to follow are set forth in GAO's Standards for Internal Controls in the Federal Government, published in 1983 pursuant to the Federal Manager's Financial Integrity Act of 1982.

Conclusions

The costs and potential benefit of the nation's I/M programs underscore the importance of OMS' role in assessing their compliance and effectiveness. However, OMS does not have the current information to make these assessments in many cases.

With respect to compliance, OMS is not obtaining comprehensive operating data from states with I/M programs because it did not impose a specific data reporting requirement upon the states. As a result, most states have submitted far less than the amount of information needed by OMS to assess the programs' compliance with their respective SIPs. OMS can also obtain needed operating data during audits. However, we found that OMS infrequently audits many programs, with half of the programs not being audited for over 2 years. Given that operating data are needed on a biannual basis, audits are not a timely means of obtaining information. Moreover, scheduled audits could become more infrequent as additional programs begin operation in the near future. Infrequent audits increase the reliance OMS must place on the states' submission of operating data.

OMS has recognized the importance of obtaining specific operating data on I/M programs and has drafted a proposed policy that includes a requirement for states to submit specific operating data on a semiannual basis. However, OMS is awaiting final action on the Clean Air Act reauthorization before formally issuing such a requirement. Such a delay is, in our opinion, unwarranted. Although the inclusion in the act of a stronger policy for I/M programs would help EPA justify its actions to states, EPA currently has the authority to implement such a policy.

In addition, OMS has not conducted overall effectiveness measurements for many of the state programs largely because it believes that it can assess the emission reduction status of many of these programs without conducting a formal measurement. However, without the measurement, OMS cannot determine the severity of the operating problems nor the degree to which programs are noncompliant with their SIP. We believe that without measuring and documenting the effectiveness of all programs on a regular basis, OMS is not fully meeting its responsibility to oversee I/M programs.

Recommendations

In order to ensure that state I/M programs are operating effectively and in compliance with their state plans for achieving air quality standards, we recommend that the Administrator, EPA,

- not wait for passage of the Clean Air Act amendments and proceed with efforts to formally require states to submit semiannually specific operating data, such as the number of vehicles by model year passing or failing emission tests, and
- ensure that program results are compared to minimum emission reduction requirements by conducting effectiveness measurements of I/M programs periodically.

Inspection/Maintenance Programs in Operation as of August 1989

States with I/M programs	Affected urban areas
Alaska[a]	Anchorage Fairbanks
Arizona	Phoenix Tucson
California	Bakersfield Fresno Los Angeles Sacramento San Diego San Francisco Stockton Visalia
Colorado	Colorado Springs Denver Ft. Collins Greeley
Connecticut	Statewide
Delaware	Wilmington
District of Columbia	Districtwide
Georgia	Atlanta
Idaho	Boise
Illinois	Chicago East St. Louis
Indiana	Chicago suburbs Louisville suburbs
Kentucky[a]	Cincinnati suburbs Louisville
Louisiana	Baton Rouge
Maryland	Baltimore Washington, D.C., suburbs
Massachusetts	Statewide
Michigan	Detroit
Missouri	St. Louis
Nevada	Las Vegas Reno
New Hampshire	Nashua
New Jersey	Statewide
New Mexico	Albuquerque
New York	New York City
North Carolina	Charlotte Raleigh
Ohio	Cincinnati Cleveland
Oklahoma	Oklahoma City Tulsa

(continued)

States with I/M programs	Affected urban areas
Oregon	Portland Medford
Pennsylvania	Allentown Philadelphia Pittsburgh
Tennessee[a]	Memphis Nashville
Texas	Dallas El Paso Houston
Utah[a]	Davis County Provo Salt Lake City
Virginia	Washington, D.C., suburbs
Washington	Seattle Spokane
Wisconsin	Kenosha Milwaukee Racine

[a]This state operates a separate I/M program for each affected urban area.

Major Contributors to This Report

Resources, Community, and Economic Development Division, Washington, D.C.

Peter F. Guerrero, Associate Director
William F. McGee, Assistant Director
John R. Schulze, Assignment Manager
Mitchell B. Karpman, Operations Research Analyst

Detroit Regional Office

Anthony A. Krukowski, Evaluator-in-Charge
Odell W. Bailey, Jr., Site Senior
Randy M. DiRosa, Staff Evaluator
Kathleen Ward, Technical Analyst

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