EPA 450/2-74-003
(APTD-1352c)
February 1974

BACKGROUND INFORMATION FOR NEW SOURCE PERFORMANCE STANDARDS:

Asphalt Concrete Plants
Petroleum Refineries
Storage Vessels
Secondary Lead Smelters and Refineries
Brass or Bronze Ingot Production Plants
Iron and Steel Plants
Sewage Treatment Plants

Volume 3, PROMULGATED STANDARDS

U.S. ENVIRONMENTAL PROTECTION AGENCY

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

February 1974

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Note: The first two volumes published under the title Background Information for Proposed New Source Performance Standards (Volume 1, Main Text and Volume 2, Appendix: Summary of Test Data) were issued under Environmental Protection Agency publication numbers APTD-1352a and APTD-1352b, respectively. Since their publication, EPA has adopted a new numbering system for its documents. Therefore, this document--Volume 3, Promulgated Standards--was issued as publication number EPA-450/2-74-003 (APTD-1532c).

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TABLE OF CONTENTS

LIST OF FIGURES v
LIST OF TABLES v
ABSTRACT vii
CHAPTER 1. INTRODUCTION 1
CHAPTER 2. GENERAL CONSIDERATIONS 3
SUBPART A, GENERAL PROVISIONS 3
OPACITY STANDARDS 5
TEST METHODS 7
CHAPTER 3. ASPHALT CONCRETE PLANTS 9
SUMMARY OF PROMULGATED STANDARDS 9
DISCUSSION OF PROMULGATED REGULATION 9
Change in the Concentration Standard 9
Change in the Opacity Standard 13
Applicability of the Standard 14
Revisions to the Cost Estimates 14
Minor Revisions to the Regulation 15
CHAPTER 4. PETROLEUM REFINERIES 17
SUMMARY OF PROMULGATED STANDARDS 17
Fuel Gas Combustion Systems 17
Fluid Catalytic Cracking Unit Catalyst Regenerators 17
DISCUSSION OF PROMULGATED REGULATION 19
Fuel Gas Combustion Systems 19
Flare Systems 19
Monitoring of Hydrogen Sulfide 20
Exemption of Small Refineries 20
Fluid Catalytic Cracking Unit Catalyst Regenerators 22
Change in the Opacity Standard 22
Type of Standard 24
Level of the Emission Standard 28
Exemption of Small Sources 34
CHAPTER 5. STORAGE VESSELS FOR PETROLEUM LIQUIDS 37
SUMMARY OF PROMULGATED STANDARD 37
DISCUSSION OF PROMULGATED REGULATION 37
Affected Facility 37
The Standard 39
Monitoring 39
Maintenance 40
CHAPTER 6. SECONDARY LEAD SMELTERS AND REFINERIES. 41
SUMMARY OF PROMULGATED STANDARDS 41
DISCUSSION OF PROMULGATED REGULATION 41

CHAPTER 7. SECONDARY BRASS AND BRONZE INGOT PRODUCTION PLANTS. 43
SUMMARY OF PROMULGATED STANDARDS 43
DISCUSSION OF PROMULGATED REGULATION 43
Change in the Opacity Standards. 44
CHAPTER 8. IRON AND STEEL PLANTS 47
SUMMARY OF PROMULGATED STANDARD. 47
DISCUSSION OF PROMULGATED REGULATION 47
CHAPTER 9. SEWAGE TREATMENT PLANTS 49
SUMMARY OF PROMULGATED STANDARDS 49
DISCUSSION OF PROMULGATED REGULATION 49
Change of Units for the Standard. 49
Change in the Opacity Standard. 52
Emission Test Conditions. 53
APPENDIX A. ASPHALT CONCRETE PLANT DATA SUBMITTED AFTER PROPOSAL 57
APPENDIX B. THE ECONOMIC IMPACT OF NEW SOURCE PERFORMANCE STANDARDS UPON THE ASPHALT CONCRETE INDUSTRY. 77
APPENDIX C. THE ECONOMIC IMPACT OF NEW SOURCE PERFORMANCE STANDARDS UPON PETROLEUM REFINERIES 101
APPENDIX D. LIST OF COMMENTATORS 109
APPENDIX E. SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973. . . . 117
APPENDIX F. ERRATA FOR VOLUME 1. 141
APPENDIX G. ERRATA FOR VOLUME 2. 147

LIST OF TABLES

Table

1-1. Number of Letters by Affiliation Category 2
3-1. Summary of all Emission Test Data 11
3-2. Acceptable Emission Test Data Submitted After Proposal. 12
4-1. Pollution Control Costs Imposed on Petroleum Refining 23
9-1. Relationship of Operating at Less than Rated Capacity to Mass Emissions from Impingement Scrubbers. 54
9-2. Relationship of Pressure Drop to Mass Emissions from Impingement Scrubbers. . . . 55

LIST OF FIGURES

Figure

3-1 Cost Comparison Between EPA Costs and NAPA Exhibit Costs. 15
4-1 Fluid Catalytic Cracking Unit Catalyst Regenerator Emission Control Systems . . . 26
4-2 Particulate Emissions from Fluid Catalytic Cracking Unit Catalyst Regenerators. . 30
4-3 Particulate Emissions vs. Time for Facility A 32
9-1 Particulate Emissions from Sludge Incinerators at Sewage Treatment Plants 51

ABSTRACT

This volume is the third in a series on standards of performance for asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, brass and bronze ingot production plants, iron and steel plants, and sewage treatment plants. The first two volumes gave background information and the data base for the proposed standards. This volume presents the promulgated standards and the rationale for any changes that were made, with particular attention to the problems of opacity and dilution air. Major comments received during the period for public comment are discussed where appropriate and are summarized with Agency responses in the appendix. The appendices also contain a list of commentators, new data for asphalt concrete plants, revised economic analyses for asphalt concrete plants and petroleum refineries, and errata for Volumes 1 and 2.

CHAPTER 1. INTRODUCTION

The first two volumes of this document were published in June 1973 under the title Background Information for Proposed New Source Performance Standards (APTD-1352a and APTD-1352b). They provided information on the derivation of the new source performance standards proposed in the Federal Register of June 11, 1973 (38 FR 15406), as amendments to Title 40 CFR Part 60. Standards were proposed for asphalt concrete plants, petroleum refineries, storage vessels, secondary lead smelters, secondary brass and bronze ingot production plants, iron and steel plants, and sewage treatment plants. Volume 1 discussed the sources and types of emissions for each industry, the rationale for the proposed standards, and the environmental and economic impacts of the proposed standards. Volume 2 presented summaries of the source test data upon which the proposed standards were based.

During the public comment period following proposal, EPA received 253 letters from various industry representatives, environmental groups, State and local agencies, and private citizens. Table 1-1 presents a breakdown of these letters by category of affiliation. Over 65 percent of the letters concerned the standard proposed for asphalt concrete plants. In addition to those 253 letters, EPA received 152 letters from 94 Congressmen, of which 142, or over 93 percent, likewise concerned the proposed standard for the asphalt concrete industry. The comments were all carefully evaluated; in many cases, staff engineers telephoned the commentators to clarify their comments or to ask for elaboration on certain points. The comments received were very helpful in pointing out problems with the proposed standards; in some cases, comments addressed to one issue stimulated EPA personnel to rethink other aspects of the standards-setting rationale.

In response to the comments received, and in response to new data received after proposal, some revisions were made to the regulations covering the seven industries cited above. This volume, which accompanies the promulgated regulations, summarizes the promulgated standards and discusses those issues that led to any revisions. Chapter 2, General Considerations, deals with revisions made to the General Provisions, and covers two issues that were common to most of the seven industries. It was evident from the many comments received concerning opacity standards and uses of dilution air that EPA had not clearly stated its position on these subjects. Chapter 2 therefore presents a discussion of the intent of opacity standards and a discussion of the revision in the regulations that covers uses of dilution air.

The promulgated standards are summarized by industry in the following chapters. Any changes in the applicable regulations are discussed, and a rationale for any such changes is presented.

TABLE 1-1. NUMBER OF LETTERS BY AFFILIATION CATEGORY

Category	Number received
State and local air pollution control agencies	12
State and local governmental agencies	6
Federal government	4
Congress	1
Asphalt associations	24
Asphalt companies	141
Asphalt plant equipment manufacturers	1
Petroleum refiners	26
Petroleum product storage companies	7
Petroleum associations	7
Brass and bronze associations	1
Iron and steel plants	2
Consulting firms	12
Control equipment manufacturers	4
Miscellaneous	5
Total	253

Asphalt concrete plant data submitted after proposal are found in Appendix A, and Appendix B is a revised cost analysis for this industry. A revised estimate of the economic impact of the promulgated standard for petroleum refineries is contained in Appendix C. Appendix D presents, by number assigned, the names and affiliations of those who wrote to EPA during the public comment period. A summary of their major comments and EPA's responses to the comments may be seen in Appendix E. Appendices F and G, respectively, contain errata for Volumes 1 and 2 of this document.

CHAPTER 2. GENERAL CONSIDERATIONS

This chapter treats those matters which bear on all, or nearly all, of the new source performance standards.

Subpart A, General Provisions

The regulatory requirements in subpart A of 40 CFR 60 apply to all new source performance standards. These general provisions were not reprinted in their entirety in the Federal Register of June 11, 1973, in which this current group of new source performance standards was proposed; only proposed changes to subpart A are to be found in that issue. To read subpart A in its current entirety, one can refer to the Federal Register of December 23, 1971 (page 24877), which contains the first group of new source performance standards; to the Federal Register of October 15, 1973 (page 28564), which contains the provisions applicable to emissions from sources during periods of startup, shutdown, and malfunction; and to the changes in subpart A promulgated with this group of new source performance standards. The changes to subpart A promulgated with this group of new source standards are discussed below.

1. Two definitions are revised, those for "commenced" and "standards," to clarify their meanings. "Commenced" relates to the definition of "new source" in section 111(a)(2) of the Act and specifies the actions which, if taken by an owner/operator of a source on or after the date on which a new source performance standard is proposed in the Federal Register, cause his source to be subject to the promulgated standard. The change removed one of the previously included actions by an owner/operator, that of entering into a "binding agreement" to construct or modify a source. The phrase "binding agreement" was duplicate terminology for the phrase "contractual obligation" but was being construed incorrectly to apply to other arrangements. Deletion of the first phrase and retention of the second phrase eliminate the problem. "Standard conditions" refers to the temperature and pressure at which all air volumes are to be calculated. The change replaces "standard or normal" with "standard" to avoid the confusion, noted by commentators, created by the duplicate terminology, and also fixes both the temperature and pressure in commonly used metric units to be consistent with the national policy of converting to the metric system.

2. Four definitions are added: "reference method," "equivalent method," "alternative method," and "run," which relate to the performance testing of new sources to determine compliance with regulatory emission limitations. They are added to clarify the terms used in changes to section 60.8, Performance Tests, discussed below.

3. The definition of "particulate matter" is added to the General Provisions and removed from each of the regulations pertinent to new sources to avoid repeating the

definition, and it is changed to include "as measured by an equivalent or alternative method."

4. The section dealing with abbreviations is revised (and reprinted in its entirety) to include new abbreviations, to agree more closely with standard usage, and to alphabetize the listing.

5. The address to which all requests, reports, applications, submittals, and other communications submitted to the Administrator pursuant to any provision of the regulation will be sent is changed from the Office of General Enforcement in Washington, D. C., to the Director of the Enforcement Division in the appropriate regional office of EPA, and the addresses of all ten regional offices are included. The "in triplicate" requirement is changed to "in duplicate."

6. Some of the wording is changed in section 60.6, Review of plans. This section provides for EPA review of plans for construction and modification of sources upon request by owners/operators. The change clarifies the requirement that a separate request must be submitted for each project but not for each facility affected by a regulatory emission limitation. Each affected facility, however, must be identified and appropriately described.

7. The requirement for owners/operators to maintain a file of the data and records required by the new source performance standards is added to General Provisions and removed from each of the regulations for new sources to avoid repetition.

8. Section 60.8, which deals with the performance testing required of new sources to determine compliance with regulatory emission limitations, is amended (1) to require owners/operators to give the Administrator 30 days' instead of 10 days' advance notice of performance testing to provide the Administrator with a better opportunity to have an observer present; (2) to specify the Administrator's authority to permit, in specific cases, the use of minor changes to reference methods, the use of equivalent methods, the use of alternative methods, or the waiver of the requirement for performance testing; and (3) to specify that each performance test shall consist of three runs except where the Administrator approves the use of two runs and that the arithmetic mean of the results shall be used to determine compliance.

9. Section 60.12, Circumvention, is added to make it clear that owners/operators are prohibited from using devices or techniques which conceal rather than control emissions in order to comply with regulatory emission limitations. The proposed new source performance standards each contained provisions intended to prohibit the dilution of gases to conceal emissions. Many commentators pointed out the inequities of these provisions and the vagueness of the language used. Because many processes require the addition of air in various quantities for cooling, for enhancing combustion, and for other useful purposes, it was deemed preferable to state clearly what is prohibited and to use the Administrator's authority to specify the conditions under which compliance testing is carried out in each case to ensure that the prohibited concealment is not used.

Opacity Standards

It is evident from comments received that an inadequate explanation was given for applying both an enforceable opacity standard and an enforceable concentration standard to the same source and that the relationship between the concentration standard and the opacity standard was not clearly presented. Because all but one of the regulations include these dual standards, this subject is dealt with here from the general viewpoint. Specific changes made to the regulations proposed are discussed in each of the chapters devoted to the regulations for specific sources.

A discussion of the major points raised by the comments on the opacity standard follows:

1. Several commentators felt that opacity limits should be only guidelines for determining when to conduct the stack tests needed to determine compliance with concentration/mass standards. Several other commentators expressed the opinion that the opacity standard was more stringent than the concentration/mass standard.

As promulgated, the opacity standards are regulatory requirements, just like the concentration/mass standards. It is not necessary to show that the concentration/mass standard is being violated in order to support enforcement of the opacity standard. Where opacity and concentration/mass standards are applicable to the same source, the opacity standard is not more restrictive than the concentration/mass standard. The concentration/mass standard is established at a level which will result in the design, installation and operation of the best adequately demonstrated system of emission reduction (taking costs into account) for each source. The opacity standard is established at a level which will require proper operation and maintenance of such control systems on a day-to-day basis, but not require the design and installation of a control system more efficient or expensive than that required by the concentration/mass standard.

Opacity standards are a necessary supplement to concentration/mass standards. Opacity standards help ensure that sources and emission control systems continue to be properly maintained and operated so as to comply with concentration/mass standards. Particulate testing by EPA method 5 and most other techniques requires an expenditure of $3,000 to $10,000 per test including about 300 man-hours of technical and semi-technical personnel. Furthermore, scheduling and preparation are required such that it is seldom possible to conduct a test with less than 2 weeks notice. Therefore, method 5 particulate tests can be conducted only on an infrequent basis.

If there were no standards other than concentration/mass standards, it would be possible to inadequately operate or maintain pollution control equipment at all times except during periods of performance testing. It takes 2 weeks or longer to schedule a typical stack test. If only small repairs were required, e.g., pump or fan repair or replacement of fabric filter bags, such remedial action could be delayed until shortly

before the test was conducted. For some types of equipment such as scrubbers, the energy input (the pressure drop through the system) could be reduced when stack tests weren't being conducted, and this could result in the release of significantly more particulate matter than normal. Therefore, EPA has required that operators properly maintain air pollution control equipment at all times (40 CFR 60.11(d)) and meet opacity standards at all times except during periods of startup, shutdown, and malfunction (40 CFR 60.11(c)), and during other periods of exemption as specified in individual regulations.

Opacity of emissions is indicative of whether control equipment is properly maintained and operated. However, it is established as an independent enforceable standard, rather than an indicator of maintenance and operating conditions because information concerning the latter is peculiarly within the control of the plant operator. Furthermore, the time and expense required to prove that proper procedures have not been followed are so great that the provisions of 40 CFR 60.11(d) by themselves (without opacity standards) would not provide an economically sensible means of ensuring on a day-to-day basis that emissions of pollutants are within allowable limits. Opacity standards require nothing more than a trained observer and can be performed with no prior notice. Normally, it is not even necessary for the observer to be admitted to the plant to determine properly the opacity of stack emissions. Where observed opacities are within allowable limits, it is not normally necessary for enforcement personnel to enter the plant or contact plant personnel. However, in some cases, including times when opacity standards may not be violated, a full investigation of operating and maintenance conditions will be desirable. Accordingly, EPA has requirements for both opacity limits and proper operating and maintenance procedures.

2. Some commentators suggested that the regulatory opacity limits should be lowered to be consistent with the opacity observed at existing plants; others felt that the opacity limits were too stringent. The regulatory opacity limits are sufficiently close to observed opacity to ensure proper operation and maintenance of control systems on a continuing basis but still allow some room for minor variations from the conditions existing at the time opacity readings were made.

3. There are specified periods during which opacity standards do not apply. Commentators questioned the rationale for these time exemptions as proposed, some pointing out that the exemptions were not justified and some that they were inadequate. Time exemptions further reflect the stated purpose of opacity standards by providing relief from such standards during periods when acceptable systems of emission reduction are judged to be incapable of meeting prescribed opacity limits. Opacity standards do not apply to emissions during periods of startup, shutdown, and malfunction (see Federal Register of October 15, 1973, 38 FR 28564), nor do opacity standards apply during periods judged necessary to permit the observed excess emissions caused by soot-blowing and unstable process conditions. Some confusion resulted from the fact that the startup-shutdown-malfunction regulations were proposed separately (see Federal Register of

May 2, 1973) from the regulations for this group of new sources. Although this was pointed out in the preamble (see Federal Register of June 11, 1973) to this group of new source performance standards, it appears to have escaped the notice of several commentators.

4. Other comments, along with restudy of sources and additional opacity observations, have led to definition of specific time exemptions, where needed, to account for excess emissions resulting from soot-blowing and process variations. These specific actions replace the generalized approach to time exemptions, that of 2 minutes per hour, contained in all but one of the proposed opacity standards. The intent of the 2 minutes was to prevent the opacity standards from being unfairly stringent and reflected an arbitrary selection of a time exemption to serve this purpose. Comments noted that observed opacity and operating conditions did not support this approach. Some pointed out that these exemptions were not warranted; others, that they were inadequate. The cyclical basic oxygen steel-making process, for example, does not operate in hourly cycles and the inappropriateness of 2 minutes per hour in this case would apply to other cyclical processes which exist both in sources now subject to standards of performance and sources for which standards will be developed in the future. The time exemptions now provide for circumstances specific to the sources and, coupled with the startup-shutdown-malfunction provisions and the higher-than-observed opacity limits, provide much better assurance that the opacity standards are not unfairly stringent.

Test Methods

Test Methods 10 and 11 as proposed contained typographical errors in both text and equations that are now corrected. Some wording is changed to clarify meanings and procedures as well.

In Method 10, which is for determination of CO emissions, the term "grab sampling" is changed to "continuous sampling" to prevent confusion. The Orsat analyzer is deleted from the list of analytical equipment because a less complex method of analysis was judged sufficiently sensitive. For clarification, a sentence is added to the section on reagents requiring calibration gases to be certified by the manufacturer. Temperature of the silica gel is changed from 177°C (350°F) to 175°C (347°F) to be consistent with the emphasis on metric units as the primary units. A technique for determining the CO_2 content of the gas has been added to both the continuous and integrated sampling procedures. This technique may be used rather than the technique described in Method 3. Use of the latter technique was required in the proposed Method 10.

Method 11, which is for determination of H_2S emissions, is modified to require five midget impingers rather than the proposed four. The fifth impinger contains hydrogen peroxide to remove sulfur dioxide as an interferent. A paragraph is added specifying the hydrogen peroxide solution to be used, and the procedure description is altered to include procedures specific to the fifth impinger. The term "iodine number flask" is changed to "iodine flask" to prevent confusion.

CHAPTER 3. ASPHALT CONCRETE PLANTS

SUMMARY OF PROMULGATED STANDARDS

The promulgated standards of performance for asphalt concrete plants limit emissions of particulate matter as follows:

1. No more than 90 mg/dscm (0.04 gr/dscf).
2. Less than 20 percent opacity.

Visible emissions caused solely by the presence of uncombined water are not subject to the opacity standard.

The opacity standard, to ensure that emissions of particulate matter are properly collected and vented to a control system, applies to the sources specified in the applicability section of the regulation. The concentration standard applies to emissions of particulate matter from the control system, as evidenced by the test methods required for determining compliance with this standard.

DISCUSSION OF PROMULGATED REGULATION

The proposed standards for asphalt concrete plants clearly generated the most public response. Over four times as many comments were received on these standards as on standards for the other six source categories. In response to the comments and new information received, several revisions were made to the proposed standards. The major differences between the proposed standards and the promulgated standards are:

1. The concentration standard has been changed from no more than 70 mg/Nm^3 (0.03 gr/dscf) to no more than 90 mg/dscm (0.04 gr/dscf).
2. The opacity standard has been changed from less than 10 percent except for 2 minutes in any 1 hour to less than 20 percent and the exemption for 2 minutes per hour has been removed.
3. The definition of affected facility has been reworded to clarify the applicability of the standard.

Change in the Concentration Standard

The preamble to the proposed standard urged all interested parties to submit factual data during the comment period to ensure that the standard for asphalt concrete plants would, upon promulgation, be consistent with the requirements of section 111 of the Act. A substantial amount of information on emission tests was submitted in response to this request.

The proposed concentration standard was based on the conclusion that the best systems of emission reduction, considering cost, are well-designed, well-operated, and well-maintained baghouses or venturi scrubbers. The emission test data available at the

time of proposal indicated that such systems could attain an emission level of 70 mg/Nm^3, or 0.031 gr/dscf. After considering comments on the proposed standard and new emission test data, a thorough evaluation was made of the achievability of the proposed standard. As a result of this evaluation, the concentration standard was changed to 90 mg/dscm, or 0.04 gr/dscf.

Table 3-1 summarizes all of the emission data received after proposal and includes data for plants equipped with control systems which are considered less efficient than baghouses or venturi scrubbers. The four plants included under "low-energy scrubber-equipped" that had emission levels less than 0.031 gr/dscf were equipped with two or more low-energy scrubbers in series after the primary control device(s). The information received for the 25 plants included under "unknown control device-equipped" did not identify the control equipment used nor the test procedures followed to collect the data; therefore, these data could not be used in the evaluation of the achievability of the proposed standard. Of the test data included under "baghouse- or venturi scrubber-equipped," some were considered invalid because incorrect test procedures were followed or because the control equipment was improperly operated or maintained. The data for the two plants in the category 0.041 to 0.05 gr/dscf, the data for the plant in the category 0.051 to 0.06 gr/dscf, and the data for the plant in the category >0.061 gr/dscf were not considered. acceptable for the following reasons:

1. The baghouses on the two plants having emissions in the range 0.041 to 0.05 gr/dscf had a fabric with a permeability greater than that considered to be best demonstrated control technology (considering costs),
2. A torn bag was discovered at the conclusion of the test on the plant having emissions in the range 0.051 to 0.06 gr/dscf, and
3. Improper test procedures that would have affected the accuracy of the test results were used at the plant having emissions greater than 0.06 gr/dscf.

Table 3-2 summarizes the acceptable test data that were received during the comment period and that were taken from plants equipped with either baghouses or venturi scrubbers. As can be seen, 11 plants equipped with baghouses and three equipped with venturi scrubbers had emissions less than 0.031 gr/dscf; however, two baghouse-equipped plants had emissions between 0.031 and 0.04 gr/dscf. Although a limited amount of information was provided on these plants, the test procedures used were reported to comply with those of EPA method 5 and the control equipment was reported to have been properly operated and maintained.

Table 3-1. SUMMARY OF ALL EMISSION TEST DATA SUBMITTED AFTER PROPOSAL

Average outlet concentration, gr/dscf	Number of plants achieving indicated concentration			
	Baghouse- or venturi scrubber-equipped	Low-energy scrubber-equipped	Unknown control device-equipped[a]	Total
<0.031	14	4[b]	0	18
0.032-0.04	2	0	0	2
0.041-0.05	2[c]	3	1	6
0.051-0.06	1[c]	0	2	3
>0.06	1[c]	4	22	27
Total	20	11	25	56

[a]Inadequate information provided on control equipment and plant process variables did not allow for a more definitive classification of this data.

[b]Plants were equipped with two or more low-energy scrubbers in series after the primary control device(s).

[c]Data for these plants were not considered acceptable.

Table 3-2. ACCEPTABLE EMISSION TEST DATA SUBMITTED AFTER PROPOSAL

Average outlet concentration, gr/dscf	Number of plants achieving indicated concentration		
	Baghouse-equipped	Venturi scrubber-equipped	Total
≤0.031	11	3	14
0.032 to 0.04	2	0	2
0.041 to 0.05	0	0	-
0.051 to 0.06	0	0	-
>0.061	0	0	-
Total	13	3	16

In addition to these two plants that had emissions between 0.031 and 0.04 gr/dscf, one of the four plants EPA tested during the development of the proposed standards had average emissions of slightly greater than 0.031 gr/dscf. This tends to indicate that the proposed standard may not be achievable in all cases at all times with a baghouse or with a venturi scrubber.

Appendix A presents all of the data submitted during the public comment period. These data consist of complete or partial stack test reports. This information has been available for public inspection since its receipt by EPA at the Office of Public Affairs, 401 M Street S.W., Washington, D. C., and the Office of Air Quality Planning and Standards, Durham, North Carolina. The average test results for facilities O,Q,R,S,T and U, as presented in Appendix A, are summarized in Table 3-2. Facility P is not included in Table 3-2 because the test data were judged to be inaccurate due to improper test procedures employed. Table 3-2 also includes final test results for 10 other asphalt plants; only the final test results were submitted by the commentators offering these results. Nine of the 12 final test results submitted by the Los Angeles County Air Pollution Control District were considered to be from well-controlled plants and as such were included in Table 3-2; the other three plants were controlled with baghouses equipped with fabrics other than those considered to be required in a best system of emission reduction. A final test result from another asphalt plant was also included in Table 3-2. This test result was considered acceptable because telephone conversations with the plant operator indicated that the plant was tested in conformance with EPA method 5 and the plant was equipped with the best system of emission reduction.

Some of the major comments received from the industry were: (1) the proposed concentration standard of 0.031 gr/dscf cannot be attained either consistently or at all with currently available equipment; (2) the standard should be 0.06 gr/dscf; (3) the standard should allow higher emissions when heavy fuel oil is burned; (4) the type of aggregate used by a plant changes and affects the emissions; (5) EPA

failed to consider the impact of the standard on mobile plants, continuous-mix plants, and drum-mixing plants; and (6) the EPA control cost estimates are too low. Detailed responses to these comments and others are given in Appendix E. When considered as a whole, along with the emission data submitted after proposal (Table 3-2), the comments justify revising the standard. The revision is merely a change in EPA's judgment about what emission limit is achievable using the best systems of emission reduction. The revision is in no way a change in what EPA considers to be the best systems of emission reduction which, taking into account the cost of achieving such reduction, have been adequately demonstrated; these are still considered to be well-designed, -operated, and -maintained baghouses or venturi scrubbers.

Change in the Opacity Standard

The opacity standard covering asphalt concrete plants has been revised to limit visible emissions to less than 20 percent opacity. This revision reflects receipt of new data, reevaluation of the data collected before proposal of the regulation, and the separate promulgation of regulations which exempt from opacity standards any emissions generated during periods of startup, shutdown, or malfunction (see Federal Register of October 15, 1973, 38 FR 28564).

In response to comments received on the proposed opacity standard, additional data were obtained on visible emissions from three well-controlled plants. Two of these three plants were equipped with baghouses, and the third plant was equipped with a venturi scrubber. The opacity of the emissions from these three plants was determined visually by one or two qualified observers. The observations were made for a total of 15 hours at the three plants. No visible emissions were observed from the control equipment on any of the plants. In addition, one plant showed no visible fugitive emissions. Two plants, however, had short periods of visible fugitive emissions that were typically at 10 percent opacity, but in one case up to 45 percent for 1 minute. These fugitive emissions were observed at various points within the two plants. No emission points were common to both plants. For example, while one plant had visible fugitive emissions from the screening system, the other plant did not; i.e., the other plant adequately controlled emissions from that system. Inspection of the two plants having visible fugitive emissions, together with the fact that one plant had no visible fugitive emissions, shows that all of the fugitive emissions observed could have been prevented by proper design, operation, and maintenance of the asphalt plant and its control equipment.

The proposed 2-minute time exemption was not based on observed increases in opacity, but was an arbitrary selection of time intended to prevent uncontrollable short-term emissions from constituting violations. The exemptions now provided by the promulgated startup-shutdown-malfunction regulations cover circumstances specific to the source. The data show that the promulgated opacity limit of less than 20 percent allows minor variations and that there are no operating circumstances or process variables that

would require exemptions in addition to those provided by the startup-shutdown-malfunction regulations.

In the judgment of the Administrator, these data show that the promulgated opacity limit is sufficiently close to observed opacity to ensure proper operation and maintenance of the process and collection equipment, and that the limit, coupled with the exemptions for startups, shutdowns, or malfunctions, constitutes an opacity standard that is not more restrictive than the concentration standard. A general discussion of the intent of opacity standards and the issues involved in setting them is included in Chapter 2 of this volume.

Applicability of the Standard

Section 60.90, applicability and designation of affected facility, is changed from that proposed in order to clarify how and when the standards apply to asphalt concrete plants. The proposed regulation was interpreted by some commentators as requiring existing plants to meet the standards of performance for new sources when equipment was normally replaced or modernized. The proposed regulation specified certain equipment, e.g., transfer and storage systems, as affected facilities, and, because of regulatory language, this could have been interpreted to mean that a new conveyor system installed to replace a worn-out conveyor system on an existing plant was a new source as defined in section 111(a)(2) of the Act. The promulgated regulation specifies the asphalt concrete plant as the affected facility in order to avoid this unwanted interpretation. An existing asphalt concrete plant is subject to the promulgated new source performance standards only if a physical change to the plant or change in the method of operating the plant causes an increase in the amount of air pollutants emitted. Routine maintenance, repair, and replacement; relocation of a portable plant; change of aggregate; and transfer of ownership are not considered modifications which would require an existing plant to comply with the standard.

Revisions to the Cost Estimates

Since the standard was proposed, the cost estimates have been reexamined and additional adjustments have been made. Many of these adjustments were prompted by comments made during the public comment period by the National Asphalt Pavement Association (NAPA) and others. In summary, the capital costs for baghouses have been revised to include: (1) a dust recycling system, (2) an inflation adjustment to 1973 dollars, (3) a change in the value of recycled fines from $9/ton to $3.40/ton, and (4) an upward adjustment in the disposal cost for dust collected from the scrubbing systems. These changes increased the estimated cost of the control equipment by approximately 20 percent. The revised estimates appear in Appendix B and represent baghouses with a 6-to-1 air-to-cloth ratio and venturi scrubbers with a pressure drop of 20 inches of water.

When NAPA submitted their public comments on the proposed standard, they also submitted cost estimates from several companies to illustrate that the industry is

experiencing greater cost in the marketplace than had been estimated by EPA. Figure 3-1 demonstrates how EPA's adjusted cost estimates for fabric filters compare to the cost estimates submitted by NAPA. It should be noted that all reported values are below EPA's adjusted costs except two. The line representing EPA's original cost estimates approximately bisects the plot of numbers submitted by NAPA. Those commenting did not submit adequate information to conduct the same analysis for wet scrubbers.

Minor Revisions to the Regulation

The comments pointed out some minor errors and oversights in the information presented in Volumes 1 and 2 of this document. Appropriate revisions were made and are presented in Appendices F and G of this volume.

Minor rewording and reorganization changes that do not affect the opacity or concentration standards are included in the final regulations. To avoid repetition, the provision covering emission-records requirements, the definition of particulate matter, and the provision prohibiting the use of dilution air were removed from individual regulations and incorporated in the General Provisions which are applicable to all sources. The paragraph concerning dilution air has also been revised to clarify misunderstandings evidenced by comments received during the public comment period. Other clarifications include: (1) deletion of "normal" from the particulate concentration standard to avoid confusion between "normal" and "standard," (2) substitution of a more specific statement of conditions under which performance tests will be conducted, and (3) deletion of a confusing and repetitive statement concerning the date upon which the standard becomes applicable. Several other changes, made to clarify EPA's intent, were incorporated in the test methods and procedures. These include a revision of the sampling time specified for performance testing, and inclusion of an exception to the promulgated procedures to make clear EPA's recognition that process variables may interfere with specified sampling conditions. Because these changes in the regulations apply to nearly all of the sources for which standards are promulgated, the rationale for changes is presented in Chapter 2, General Corsiderations, of this volume.

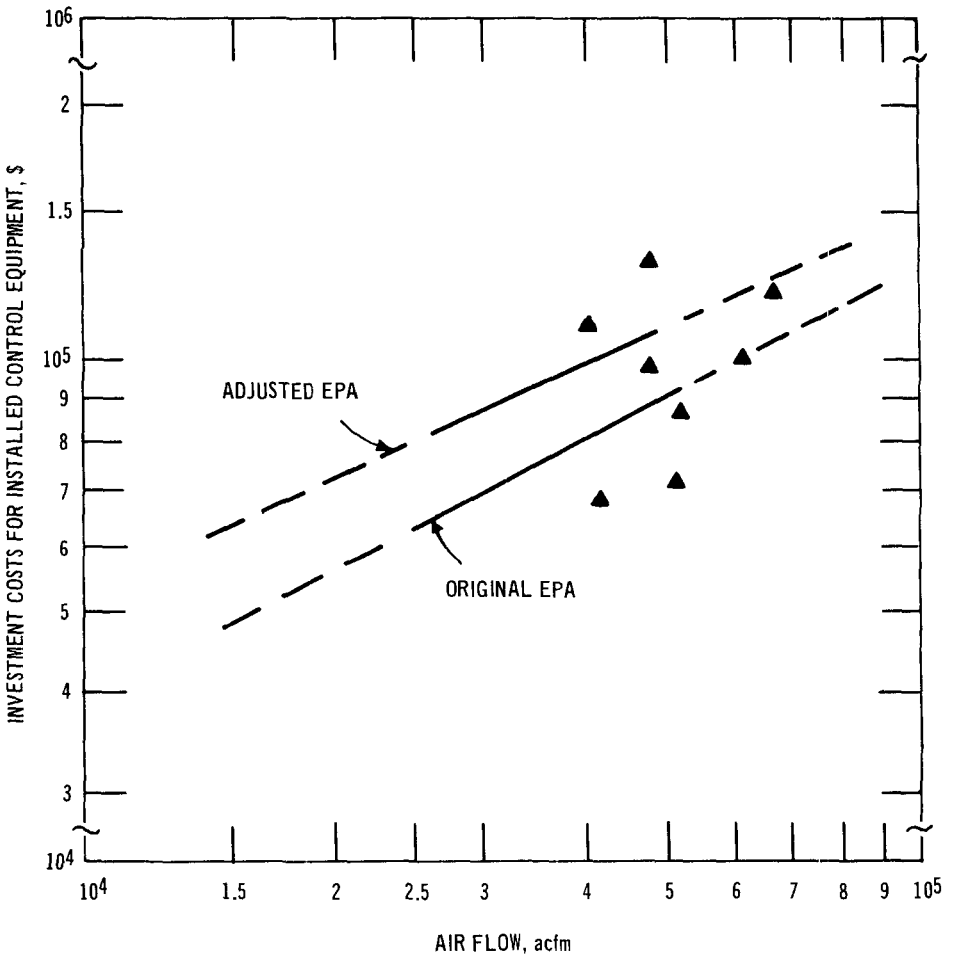

Figure 3-1. Cost comparison between EPA costs and NAPA exhibit costs.

CHAPTER 4. PETROLEUM REFINERIES

SUMMARY OF PROMULGATED STANDARDS

The promulgated standards of performance for petroleum refineries limit emissions of sulfur dioxide from fuel gas combustion systems and limit emissions of particulate matter and carbon monoxide from fluid catalytic cracking unit catalyst regenerators.

Fuel Gas Combustion Systems

The promulgated standard limits emissions of sulfur dioxide to the atmosphere from the combustion of fuel gas containing hydrogen sulfide by specifying that the fuel gas combusted shall contain no more than 230 mg/dscm (0.10 gr/dscf) hydrogen sulfide. A fuel gas combustion system is defined as any equipment such as, but not limited to, process heaters, boilers, and flares used to burn gases. However, the combustion of process upset gases in flares is exempt from the standard.

Although the standard limits sulfur dioxide emissions by specifying a limit on the hydrogen sulfide content of fuel gas combusted, compliance with the standard can be achieved by removing sulfur dioxide from the combustion effluent gases instead of removing hydrogen sulfide from the fuel gas before combustion. In these cases, however, it must be shown to the Administrator's satisfaction that treatment of the combustion gases is as effective in preventing emissions of sulfur dioxide as is removal of hydrogen sulfide from the fuel gas.

Fuel gas is defined as any gas produced by a process unit within a petroleum refinery and combusted as fuel. In addition, any gaseous mixture of natural gas and fuel gas is also considered fuel gas. However, fluid coking unit coke-burner fuel gases and fluid catalytic cracking unit catalyst regenerator fuel gases are exempt from the standard.

Fluid Catalytic Cracking Unit Catalyst Regenerators

The promulgated standards limit the rate of emission of particulate matter to the atmosphere from fluid catalytic cracking unit catalyst regenerators to no more than 1 kilogram per 1,000 kilograms (1 kg/1,000 kg) of coke burn-off in the catalyst regenerator. If, however, a carbon monoxide boiler is employed to burn the carbon monoxide contained in the catalyst regenerator exhaust gases to carbon dioxide, the rate of emission of particulate matter to the atmosphere may increase above this level when liquid or solid auxiliary fuels are burned in the boiler. In these cases, the rate of

emission of particulate matter to the atmosphere permitted by the new source performance standard must be calculated.

To calculate the rate of emission of particulate matter permitted by the standard when liquid or solid auxiliary fuels are burned in a carbon monoxide boiler, the heat input to the boiler that is attributable to these solid or liquid auxiliary fuels must first be determined in millions of calories per hour. This heat input is multiplied by an incremental emission factor of 0.18 gram per million calories, and then divided by the coke burn-off rate in the catalyst regenerator expressed in kilograms per hour. The numerical result is the increase in the rate of emission of particulate matter to the atmosphere permitted by the new source performance standard in kilograms of particulate matter per thousand kilograms of coke burn-off in the catalyst regenerator. This, added to the rate of emission of particulate matter permitted when no liquid or solid auxiliary fuels are burned in the carbon monoxide boiler (1.0 kilogram/1,000 kilograms of coke burn-off in the catalyst regenerator), determines the total rate of emission of particulate matter to the atmosphere from the catalyst regenerator that is permitted by the standard when solid or liquid auxiliary fuels are burned.

The promulgated standards also limit the opacity and carbon monoxide content of the effluent gases released to the atmosphere from the fluid catalytic cracking unit catalyst regenerator. The opacity of the effluent gases must be less than 30 percent, except for 3 minutes in any 1 hour, and the carbon monoxide concentration in the gases discharged to the atmosphere must be 500 ppm (0.050 percent by volume) or less. The 3-minute period in any 1 hour during which the opacity of the gases discharged to the atmosphere may be 30 percent or more is to permit "blowing" of the boiler tubes in the carbon monoxide boiler to remove soot.

Some minor rewording and reorganization that do not change the standards are also included in the promulgated regulations. To avoid repetition, the provision covering emission-records requirements, the definition of particulate matter, and the provision prohibiting the use of dilution air were removed from individual regulations and incorporated in the General Provisions, which are applicable to all sources. The paragraph concerning dilution air has also been revised to clarify misunderstandings evidenced by comments received during the public comment period. Other clarifications include: (1) deletion of "normal" from the particulate concentration standard to avoid confusion between "normal" and "standard," (2) substitution of a more specific statement of conditions under which performance tests will be conducted, and (3) deletion of a confusing and repetitive statement concerning the date upon which the standard becomes applicable. Several other changes, made to clarify EPA's intent, were incorporated in the test methods and procedures. These include a revision of the sampling time specified for performance testing, and inclusion of an exception to the promulgated procedures to make clear EPA's recognition that process variables may interfere with

specified sampling conditions. Because these changes in the regulations apply to nearly all of the sources for which standards are promulgated, the rationale for changes is presented in Chapter 2, General Considerations, of this volume.

DISCUSSION OF PROMULGATED REGULATION

Review and evaluation of the comments received resulted in two changes to the standard proposed for fuel gas combustion devices:

(1) The combustion of process upset gas in flare systems is exempt from the promulgated standard.

(2) Hydrogen sulfide in fuel gases combusted in any number of facilities may be monitored at one point if the fuel gases combusted in each facility are of the same composition.

Review and evaluation of the comments received during the public comment period resulted in three major changes to the proposed standards for fluid catalytic cracking unit catalyst regenerators:

(1) Under the promulgated standards, the opacity of the gases discharged to the atmosphere must be less than 30 percent, except for 3 minutes in any 1 hour. The proposed standard would have limited the opacity of the effluent gases released to the atmosphere to less than 20 percent, except for 3 minutes in any 1 hour.

(2) The promulgated standards limit the rate of emission of particulate matter to the atmosphere from the catalyst regenerator in kilograms of particulate matter per 1,000 kilograms of coke burn-off in the catalyst regenerator. The proposed standard would have limited the concentration of particulate matter in the gases discharged to the atmosphere.

(3) The stringency of the standard that limits the rate of emission of particulate matter to the atmosphere has been relaxed by about 25 percent. EPA's original intent was to limit the rate of emission of particulate matter to the atmosphere from fluid catalytic cracking unit catalyst regenerators to about 0.8 kilogram of particulate matter per 1,000 kilograms of coke burn-off in the catalyst regenerator. The promulgated standard, however, limits emissions to 1.0 kilogram per 1,000 kilograms of coke burn-off.

Fuel Gas Combustion Systems

The two changes made to the proposed standard for fuel gas combustion systems do not represent any change in EPA's original intent. It was evident from the comments received, however, that the intent of the regulations was not clear. Therefore, explicit provisions were incorporated into the promulgated standard to exempt the flaring of process upset gases and to permit monitoring at one location of the hydrogen sulfide content of fuel gas combusted in any number of combustion devices.

Flare Systems

Although petroleum refinery flare systems are frequently used to routinely dispose of various low-value process gases produced within a refinery, they are installed

primarily to provide a means for safely disposing of large volumes of process upset gases suddenly and unexpectedly released from various process units. Because the frequency of process upsets and the volumes of gases which must be disposed of are highly unpredictable, it is not feasible to design or operate a gas treating facility that would prevent sulfur dioxide emissions from flare systems in these situations. A facility designed to remove hydrogen sulfide from all process upset gases prior to combustion would have to be designed to handle the immediate release of gases from all process units if each unit experienced the worst possible upset or malfunction at the same time. The costs of such a large gas treatment facility would impose a severe and unreasonable economic burden upon a refinery. Therefore, as noted on page 25 in Volume 1 of this document, the intent is that "The proposed standard does not apply to extraordinary situations, such as emergency gas releases..."

Monitoring of Hydrogen Sulfide

Within large petroleum refineries, groups of process heaters or boilers generally have a common source of fuel gas and each process heater and boiler burns fuel gas of the same composition. It was EPA's original intent to permit monitoring of fuel-gas hydrogen sulfide at one location for combustion sources having a common source of fuel gas. However, the proposed regulations did not specifically state that this was permissible, and, as many commentators pointed out, the regulations could be construed to require monitors on each process heater or boiler. Consequently, provisions are included in the promulgated regulations specifically stating that the use of common-source fuel gas monitors is acceptable.

Exemption of Small Refineries

Many commentators suggested that small petroleum refineries be exempt from the standard for fuel gas combustion systems since compliance with the standard would impose a severe economic penalty on small refineries. It was suggested that refineries of less than 40,000 bbl/day capacity be exempt and that refineries be exempt where the amount of hydrogen sulfide in the fuel gas before combustion was less than 10 tons per day.

Background information considered in proposing the sulfur dioxide standard on fuel gas combustion devices (Volume 1 of this document) included a review of the costs associated with converting hydrogen sulfide to elemental sulfur at small refineries. Based on this review, EPA concluded that the proposed standard would have little or no adverse economic impact on petroleum refineries. In light of the comments received, EPA reexamined this point with particular attention to the small refiner. Because this analysis indicates that refinery growth for both small and large refineries will not be precluded by the proposed new source performance standards for fuel gas combustion, the standard is promulgated with no exemption for small petroleum refineries.

EPA's analysis is presented in Appendix C. The domestic petroleum industry is extremely complex and highly sophisticated. Thus, any analysis of the petroleum refining industry will of necessity be based on a number of simplifying assumptions. Although the assumptions in the economic impact statement appear reasonable, the statement should not be viewed as definitively identifying specific costs; rather it identifies a range of costs and approximate impact points. The analysis examines more than the economic impact of the standard for fuel gas combustion systems. It also examines the combined economic impact of this standard for fuel gas combustion systems, the standards for fluid catalytic cracking units, the water quality effluent guidelines being developed for petroleum refineries, and EPA's regulations requiring the reduction of lead in gasoline. Essentially, the economic impact of "pollution control" is reviewed in light of the petroleum import license-fee program being administered by the Oil and Gas Office of the Department of the Interior (38 FR 9645 and 38 FR 16195).

This program is designed to encourage expansion and construction of U. S. petroleum refining capacity and expansion of U. S. crude oil production by imposing a fee or tariff on imported petroleum products and crude oil. Although this program is currently being phased into practice with the full impact not to be felt until mid-1975, the central feature of the program is to impose a fee of 21¢ per barrel above world price on imported crude oil and a fee of 63¢ per barrel above world price on imported petroleum products such as gasoline, fuel oils, and "unfinished" or intermediate petroleum products.

Under the conditions currently existing in the United States, which are forecast to continue throughout the remainder of this decade and most of the next decade, and with domestic demand for crude oil and petroleum products far outstripping domestic supply and petroleum refining capacity, the import license-fee program will encourage domestic prices of crude oil and petroleum products to increase to world levels plus the fee or tariff. Thus, an incentive of 42¢ per barrel (63¢ per barrel minus 21¢ per barrel) is provided to domestic refiners by this program. In cases where "independent" refiners continue to enjoy a captive supply of domestic crude oil, or where "major" refiners engaged in the exploration and production of domestic crude are successful in supplying their refineries with domestic crude oil, this incentive will approach the full 63¢ per barrel fee imposed on imported petroleum products.

In evaluating the economic impact associated with the new source performance standards on fuel gas combustion and fluid catalytic cracking units, it should be noted that the impact is greater on small refineries than on large refineries. This is also true of the impacts associated with the water quality effluent guidelines being developed and with the EPA regulations requiring the reduction of lead in gasoline. However, this is a natural result of the economics-of-scale associated with large refineries. Since the capacities of domestic petroleum refineries vary from 5,000 bbl/day to 500,000 bbl/day, this factor is of major importance in assessing the economic impact of the standards on small refineries.

Table 4-1 summarizes the average costs associated with the new source performance standards on fuel gas combustion devices and fluid catalytic cracking units for petroleum refineries of various processing capacities. The average costs associated with the envisioned water quality effluent guidelines and the EPA regulations requiring the reduction of lead in gasoline are also summarized.

As shown in Table 4-1, the average costs associated with new source performance standards range from 10¢ per barrel for a 5,000-barrel-per-day refinery to 2¢ per barrel for a 100,000-barrel-per-day refinery. The average costs associated with the envisioned water quality effluent guidelines and the EPA regulations requiring a reduction of the lead in gasoline range from 17¢ and 12¢ per barrel to 3¢ and 2¢ per barrel for a 5,000-barrel-per-day and a 100,000-barrel-per-day refinery, respectively. The total costs associated with "pollution control" are therefore estimated to range from 39¢ per barrel to 7¢ per barrel, respectively, for an average 5,000-barrel-per-day and an average 100,000-barrel-per-day petroleum refinery.

In light of the incentive provided to the domestic petroleum refining industry by the import license-fee program (42¢ to 63¢ per barrel), it appears that the costs of pollution control will not preclude refinery growth for either large or small refineries. Although the costs of pollution control offset to some degree this incentive, pollution control costs would almost completely offset the incentive only for a very small petroleum refinery in the range of 5,000 barrels per day. This could occur if this small refinery were operating in an environment where the incentive only amounted to 42¢ per barrel. If, however, this small refinery were operating in an environment where the incentive approached 63¢ per barrel, the import license-fee program would still provide an incentive of 24¢ per barrel to this small refinery.

The analysis indicates that the incentive provided to the domestic petroleum refining industry by the import license-fee program is greater than the costs of pollution control requirements. The differences in control costs for the small refiner relative to the large refiner will still exist, but with the fee system in operation the small refiner will not be forced into a no-growth situation because of compliance with EPA requirements. Therefore, small refineries are not exempt from the standards.

Fluid Catalytic Cracking Unit Catalyst Regenerators

Change in the Opacity Standard

The standard covering opacity of gases discharged to the atmosphere from fluid

Table 4-1. POLLUTION CONTROL COSTS IMPOSED ON PETROLEUM REFINING

Refinery capacity, bbl/day	Annualized costs, ¢/bbl				
	Air pollution regulations		Water pollution regulations	Regulations on lead in gasoline	Total
	Fuel gas	Catalytic cracking			
5,000	10	-[a]	17	12	39
10,000	5	2	8	6	21
50,000	2	1	4	2	9
100,000	1.5	0.5	3	2	7

[a]Petroleum refinery judged too small to support a fluid catalytic cracking unit.

catalytic cracking units has been revised to limit emissions to less than 30 percent opacity, except for 3 minutes per hour. This revision is based on new data, reevaluation of the data collected before proposal of the regulation, and the separate promulgation of regulations exempting from opacity standards any emissions generated during periods of startup, shutdown, or malfunction (see Federal Register of October 15, 1973, 38 FR 28564). In response to comments received, additional data were obtained on visible emissions from four well-controlled plants. All four of these plants were equipped with electrostatic precipitators. Opacity of the emissions from the fluid catalytic cracking units was determined by one or two qualified observers; observations were made for a total of 18-1/2 hours at the four plants.

Observations were made for 5-1/2 hours at one unit that had emissions below the standard (1 kg/1,000 kg of coke burn-off in the catalyst regenerator). Two sootblows of 3 minutes each at 100 percent opacity were observed; also observed were many short periods of visible emissions that were not sootblows, ranging from 15 seconds to several minutes, at 20 percent opacity or greater. These short periods totaled 30 minutes. Operating and maintenance procedures were checked and discussed with the operator; no normal process variations were found that would cause visible emissions in excess of the promulgated standard at a well-controlled unit.

Observations at the other three units resulted in similar data. Except at one plant that blows soot for 1 hour at night, no sootblows were observed to exceed 30 percent for longer than 3 minutes. This refinery is in the process of changing to a system that would take only 3 minutes per hour.

These data indicate the need for an opacity limit higher than the proposed limit of 20 percent. The data support raising the limit to less than 30 percent and retaining the 3-minute exemption per hour to account for sootblowing. The opacity standard is therefore promulgated at less than 30 percent opacity, except for 3 minutes in any 1 hour.

In the judgment of the Administrator, these data show that the promulgated opacity limit of less than 30 percent opacity except for 3 minutes in any 1 hour is sufficiently close to observed opacity to ensure proper operation and maintenance of the process and collection equipment, and that the limit, coupled with the exemptions for startups, shutdowns, and malfunctions, constitutes an opacity standard that is not more restrictive than the process weight standard. A general discussion of the intent of opacity standards and the issues involved in setting them is included in Chapter 2 of this volume.

Type of Standard

Several commentators pointed out that the volume of gases discharged to the atmosphere from fluid catalytic cracking unit catalyst regenerators can vary significantly,

depending upon the overall system used to control emissions of particulate matter and carbon monoxide. Consequently, the degree of control required to meet the proposed concentration standard for particulate matter depends upon the overall emission control system employed. For example, two identical catalyst regenerators might limit the concentration of particulate matter in the gases discharged to the atmosphere to the same level, but different emission control systems might be employed and one catalyst regenerator would then be permitted by the proposed standard to emit significantly more particulate matter into the atmosphere than would the other. It was concluded, therefore, that an emission standard should be developed which would require the same degree of control of emissions from catalyst regenerators, irrespective of the emission control system employed.

The various emission control systems which can be used to control emissions of particulate matter and carbon monoxide from fluid catalytic cracking unit catalyst regenerators are shown in Figure 4-1. Each of these systems is currently being used within the petroleum refining industry.

System 1 controls emissions of carbon monoxide by complete combustion of the coke from the catalyst surface within the catalyst regenerator. This is a recent development in the technology of fluid catalytic cracking and most fluid catalytic cracking unit catalyst regenerators remove the coke from the catalyst surface under conditions which result in incomplete combustion of the coke. The exhaust gases from the regenerator, containing little or no carbon monoxide, are then cooled from 1,300-1,500°F to 500-600°F, passed through an electrostatic precipitator to remove particulate matter, and discharged to the atmosphere.

In control system 2, the effluent gases from the regenerator contain from 10 to 12 percent carbon monoxide and are incinerated in a carbon monoxide boiler to generate steam. Although the effluent gases from the regenerator are at a high temperature (1,000 to 1,200°F), additional air and auxiliary fuel must be provided to ensure the complete combustion of carbon monoxide to carbon dioxide. Following the carbon monoxide boiler, the gases pass through an electrostatic precipitator and are discharged to the atmosphere.

Control system 3 is the same as control system 2, except that the precipitator is located ahead of the carbon monoxide boiler. The effluent gases from the regenerator are cooled from 1,000-1,200°F to 500-600°F, passed through an electrostatic precipitator, combusted in the carbon monoxide boiler, and discharged to the atmosphere. Because the temperature of the gases entering the carbon monoxide boiler is in the range of 500 to 600°F rather than 1,000 to 1,200°F as in control system 2, more auxiliary fuel and air must be provided to ensure combustion of carbon monoxide to carbon dioxide.

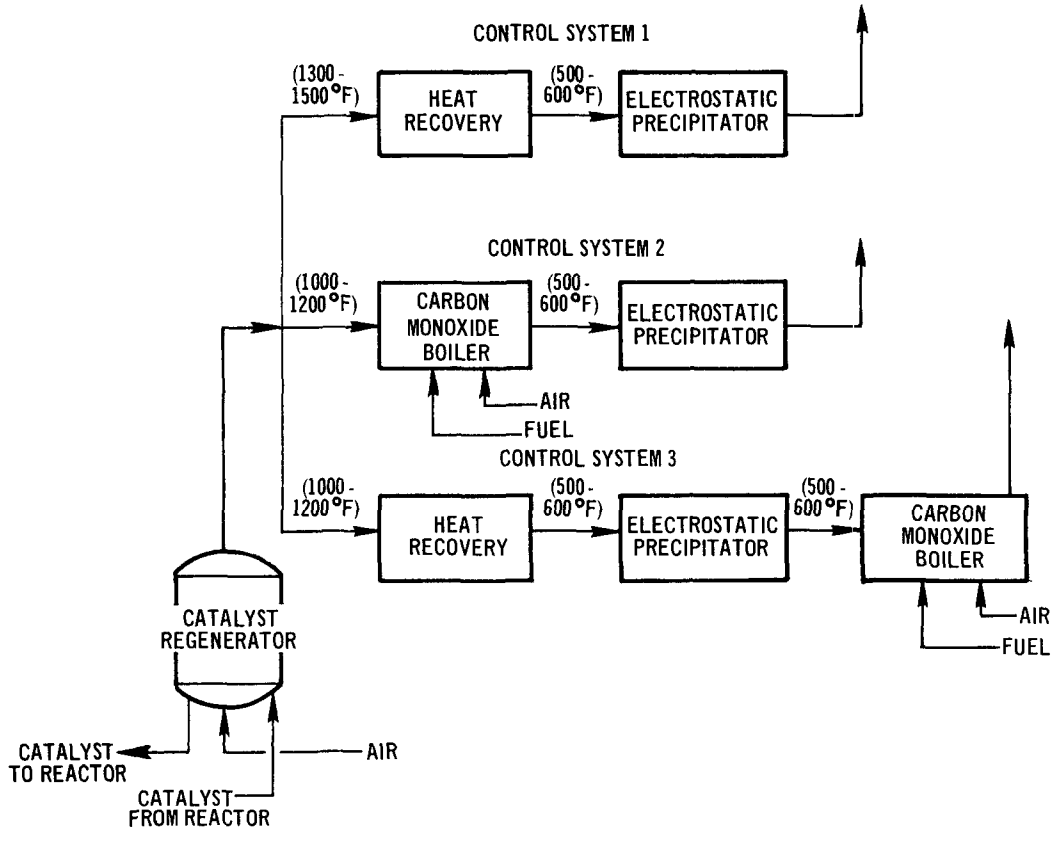

Figure 4-1. Fluid catalytic cracking unit catalyst regenerator emission control systems.

If "minimum" carbon monoxide boilers are utilized in control systems 2 and 3, the ratio of the volumes of gases discharged to the atmosphere from control systems 1, 2, and 3 is approximately 1.0:1.05:1.30. This variation in the gas volumes is due solely to the air and auxiliary fuel which must be provided to the carbon monoxide boilers in control systems 2 and 3 to ensure complete combustion of carbon monoxide.

"Minimum" carbon monoxide boilers, as the term implies, use only the minimum amounts of air and auxiliary fuel necessary to ensure combustion of carbon monoxide. In control system 2, minimum carbon monoxide boilers are normally employed because boilers using more than the minimum amounts increase the volume of gases to be treated in the electrostatic precipitators; this requires a larger precipitator and increases costs. In control system 3, however, there are no economic penalties associated with increasing the volume of gases by burning more than the minimum amounts of air and auxiliary fuel in the boiler and, in many cases, minimum carbon monoxide boilers are not used in this type of control system. This was confirmed in a limited survey, made by EPA, which shows that the ratio of the volumes of gases discharged to the atmosphere from control systems 1, 2, and 3 are frequently about 1.0:1.05:1.50 rather than 1.0:1.05:1.30. Furthermore, contacts with the major vendors that supply carbon monoxide boilers to the petroleum refining industry indicated that there were no technical limitations to prevent this ratio for control system 3 from increasing significantly above 1.50.

As a result, it was concluded by EPA that the standard limiting emissions of particulate matter from fluid catalytic cracking unit catalyst regenerators should be revised to be independent of the volume of gases discharged to the atmosphere. Frequently, a concentration emission standard can be corrected to a reference basis to compensate for excess or dilution air introduced into effluent gases. For example, the new source performance standard promulgated for municipal incinerators references all determinations of effluent gas volumes to 12 percent carbon dioxide. In the case of fluid catalytic cracking unit catalyst regenerators, however, a carbon dioxide reference basis is not adequate because the variation in volume of the effluent gases is not due to excess or dilution air, but is due to combustion of auxiliary fuel in the carbon monoxide boiler. Other methods of adjusting the volume of gases discharged to the atmosphere to a common reference basis were also found to be inadequate. Consequently, the concept of writing an emission standard limiting the concentration of particulate matter in the gases discharged to the atmosphere was abandoned.

A review of various means of expressing an emission standard to limit particulate emissions from fluid catalytic cracking unit catalyst regenerators was undertaken by EPA. The major goal was to develop an emission standard that required the same degree of control of emissions from catalyst regenerators of the same size or capacity. Various options considered were a standard requiring a certain control efficiency, a process weight standard, or a standard in terms of emissions per unit of size or capacity.

The data needed to develop an emission standard requiring a certain control efficiency were not available. The data to develop a process weight standard were available. However, the determination of the circulation rate between the fluid catalytic cracking unit reactor and the catalyst regenerator requires either a sophisticated laboratory analysis to determine the amount of coke on both the fresh catalyst from the catalyst regenerator and the deactivated catalyst from the reactor, or the development of a material and energy balance around the catalyst regenerator. In either case, the determination of the catalyst circulation rate is difficult.

The data for developing an emission standard to relate emissions to size or capacity in terms of coke burn-off rate in the catalyst regenerator were also available. Although the determination of coke burn-off rate does require some calculations, they are not complex. Consequently, an emission standard relating particulate emissions to coke burn-off rate in the catalyst regenerator has been developed and promulgated. Under the promulgated standard, the degree of control efficiency required is independent of the volume of gases discharged to the atmosphere, and emissions are limited to the same level for identical catalyst regenerators.

Level of the Emission Standard

A number of comments were received concerning the level of the proposed emission standard limiting the concentration of particulate matter in the gases discharged to the atmosphere from fluid catalytic cracking unit catalyst regenerators. Before discussing these comments, however, it is pertinent to review some aspects of the operation of fluid catalytic cracking units that were not discussed in Volume 1 of this document.

Quite literally, fluid catalytic cracking units are the heart of most moderate- and high-conversion refineries. They constitute one of the major processes for converting heavy, high molecular weight fractions of crude oil which are of low value into lighter, more valuable products such as gasoline. As a result, fluid catalytic cracking units operate continuously, with run lengths between major shutdowns or turnarounds in the range of 1 to 2 years. Turnarounds are major projects and may require 3 to 6 weeks; during turnarounds the fluid catalytic cracking unit is completely overhauled and renovated with repair crews working 24 hours per day, 7 days a week, until the unit is back into operation.

Essentially, the particulate matter emitted to the atmosphere from the catalyst regenerator in a fluid catalytic cracking unit is catalyst dust which is entrained in the effluent gases from the regenerator. To minimize this loss of catalyst, there are two stages of internal cyclones incorporated in the regenerator vessel to remove catalyst from the effluent gases and to recycle it to the fluidized bed of catalyst maintained in

the regenerator. These cyclones are shown in Figures 4 and 5 on page 18 of Volume 1 of this document. Because these internal cyclones operate under severe conditions, their collection efficiencies deteriorate with time and the concentrations of catalyst dust in the gases discharged from catalyst regenerators increase. If an electrostatic precipitator is employed to control emissions, the load on this precipitator increases as a result of this deterioration.

Precipitators function solely as air pollution control devices. The catalyst dust recovered by precipitators is normally not returned to the catalyst regenerator since it would most likely be reentrained in the effluent gases and would merely increase the load on the precipitator. Thus, even with a precipitator, the loss of catalyst from the catalyst regenerator increases as the collection efficiency of the internal cyclones deteriorates. Normally, after 1 to 2 years of continuous operation, the loss of catalyst makes continued operation of the fluid catalytic cracking unit uneconomical and the unit is shut down.

Consequently, fluid catalytic cracking unit catalyst regenerators are one of the few types of process equipment which exhibit, with time, control equipment deterioration that cannot be prevented by routine maintenance or proper operating practices. The repair or replacement of the internal cyclones within the catalyst regenerator can only be performed when the fluid catalytic unit is shut down for an equipment turnaround.

Most of the comments received on the proposed emission standard concerned equipment deterioration. Although most of the commentators felt that the emission standard could be achieved on a newly renovated catalyst regenerator following a turnaround of the fluid catalytic cracking unit, they did not feel that the standard could be achieved over the full 1- to 2-year run of a fluid catalytic cracking unit. Thus, most of the commentators recommended that the emission standard be increased from 0.022 gr/dscf to 0.044 gr/dscf.

The emission data presented in Volume 1 of this document (Figure 6, page 20) in support of the proposed standard are presented in Figure 4-2 for the promulgated standard. The proposed standard of 0.022 gr/dscf is equivalent to about 0.8 kilogram per 1,000 kilograms of coke burn-off, and 0.044 gr/dscf is equivalent to about 1.6 kilograms per 1,000 kilograms of coke burn-off.

The non-EPA data points presented for facilities A and E are based on emission data supplied by the companies operating these facilities. The data for facility A that were presented in Volume 1 of this document represented results of emission tests carried out about every 2 weeks by company personnel during the first 7 months of operation of the catalyst regenerator following a turnaround of the fluid catalytic cracking unit. The data for facility E presented both in Volume 1 of this document and in Figure 4-2 represent the results of emission tests carried out about every 2 months by company personnel during 17 months of operation of the catalyst regenerator between turnarounds of the fluid catalytic cracking unit.

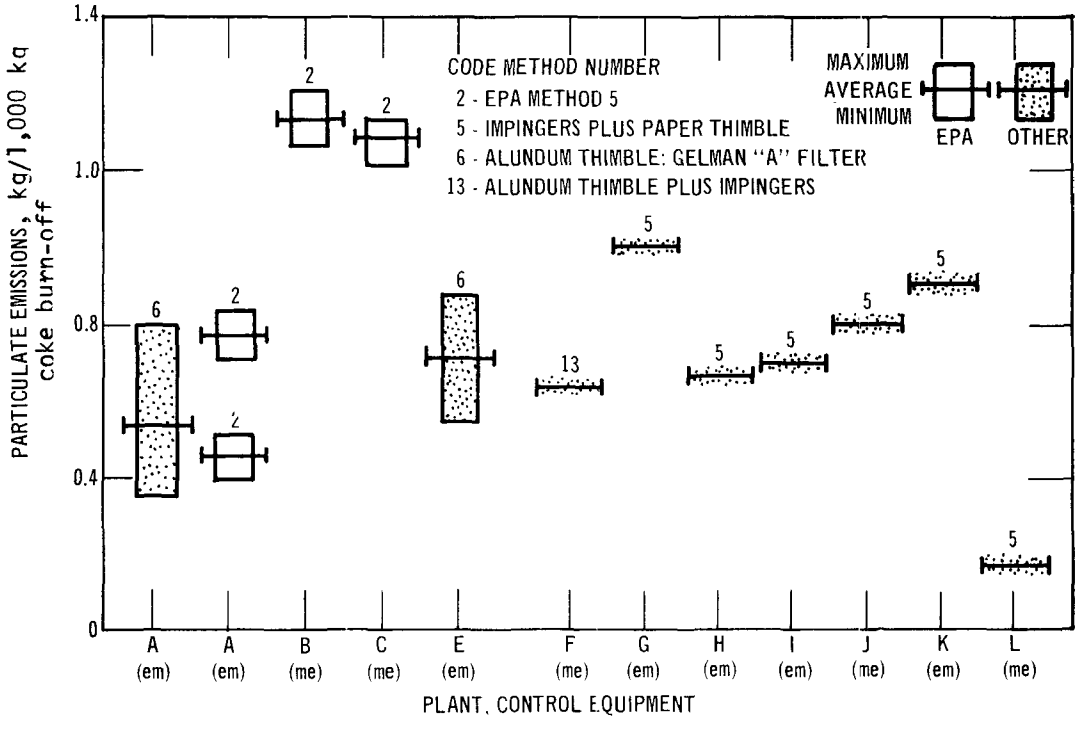

Figure 4-2. Particulate emissions from fluid catalytic cracking unit catalyst regenerators.

Following proposal of the standard, EPA requested and was supplied additional emission data by the company operating facility A. The non-EPA data point presented in Figure 4-2 for facility A now represents emission data covering 20 months of operation of the catalyst regenerator between turnarounds of the fluid catalytic cracking unit. As with the emission data initially supplied by the company operating this facility, the additional emission data consisted of the results of emission tests carried out about every 2 weeks by company personnel.

Additional emission data were also obtained on another fluid catalytic cracking unit catalyst regenerator (see the data point in Figure 4-2 for facility L). This data point is based on the results of an emission test carried out on a fluid catalytic cracking unit of about 55,000 bbl/day capacity, which was equipped with a carbon monoxide boiler followed by an electrostatic precipitator. However, at the time of the test, the fluid catalytic cracking unit had been onstream only about four months following a turnaround. Although this is not a new fluid catalytic cracking unit, a large electrostatic precipitator had been installed to control particulate emissions from the catalyst regenerator since EPA's original survey of the industry during the development of the proposed emission standard.

Although there was some consideration given during development of the proposed standard to the effect of internal-cyclone deterioration on particulate emissions from the catalyst regenerators, it was felt that this effect was relatively minor. The only data available to EPA were the data on facility E, consisting of nine data points which are so scattered that no trend in emissions over time is apparent.

Since the development of the proposed emission standard, however, the American Petroleum Institute undertook a survey of emissions from fluid catalytic cracking units. Although the information gathered by this survey is not adequate for the development of a new source performance standard, the survey data do indicate that particulate emissions from catalyst regenerators generally increase by about 35 percent during the run (between turnarounds) of a fluid catalytic cracking unit. Although there is a great deal of scatter in the data supplied by the company operating facility A, a least-squares regression analysis of these data also indicates a general increase in emissions over time (Figure 4-3).

As a result, it appears that the deterioration of internal cyclones has an adverse effect on particulate emissions released to the atmosphere from catalyst regenerators. Consequently, EPA concluded that the level of the proposed emission standard should be revised for promulgation to allow for the deterioration of the process equipment which would cause emissions to increase. The goal was then to develop an emission standard consistent with the performance of the best system of emission control on a catalyst regenerator over the normal run of a fluid catalytic cracking unit between turnarounds.

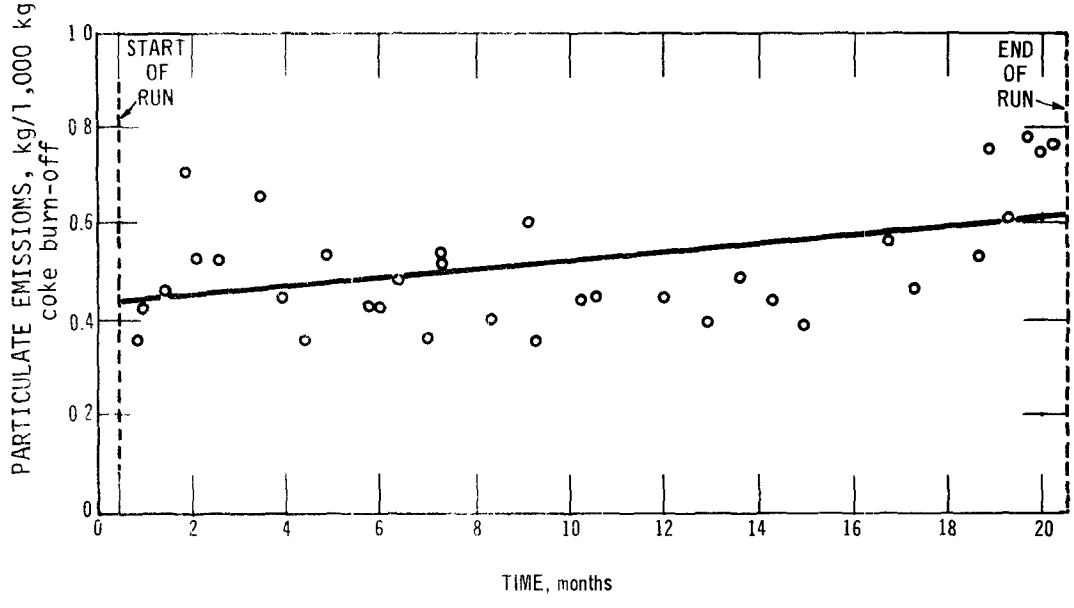

Figure 4-3. Particulate emissions versus time for facility A.

As discussed in Volume 1 of this document, collection efficiency for particulate emissions is closely related to the size of the plate area of the electrostatic precipitator. Facilities B and C (Figure 4-2) respectively employed precipitators with 175 and 190 square feet of plate area per 1,000 acfm of gases treated, and emissions were in the range of 1.2 to 1.4 kilograms per 1,000 kilograms of coke burn-off. Facility E employed a precipitator with 225 square feet of plate area per 1,000 acfm of gases treated, and emissions were in the range of 0.5 to 0.9 kilogram per 1,000 kilograms of coke burn-off. Facility A employed a precipitator with 250 square feet of plate area per 1,000 acfm of gases treated, and emissions were in the range of 0.4 to 0.8 kilogram per 1,000 kilograms of coke burn-off. Facility L employed a precipitator with 350 square feet of plate area per 1,000 acfm of gases treated, and emissions were in the range of 0.1 to 0.2 kilogram per 1,000 kilograms of coke burn-off. Similar data are not available on facilities F through K.

Because these data points are not necessarily on the same basis, they cannot be used to develop a quantitative relationship between the ratio of precipitator plate area to the volume of gases treated or to particulate emissions from catalyst regenerators. However, they do qualitatively confirm the basic design criteria; i.e., that as precipitator plate area increases, particulate collection efficiency increases and emissions decrease.

EPA's data shown in Figure 4-2 for facility A were obtained after the catalyst regenerators had been onstream about 6 and 8 months, respectively, following a turnaround of the fluid catalytic cracking unit. The data for facility L were obtained after the catalyst regenerator had been onstream about 4 months following a turnaround. The data supplied by the companies operating facilities A and E, however, were obtained over the full run of the fluid catalytic cracking unit. In addition, these two companies used the same test method to determine particulate emissions; therefore, the company-supplied data on these two facilities can be assumed to be on the same basis.

The EPA data and the company data on facilities A and E are not on the same basis, however, since the emission testing methods used by EPA and these two companies differ in many respects. On the other hand, it appears from Figure 4-2 that the company data and the EPA data are somewhat comparable because the EPA data for facility A are in the same general range as the company data for facility A. Therefore, the EPA data indicate that an emission standard in the range of 1.0 kilogram per 1,000 kilograms of coke burn-off in the catalyst regenerator would appear to be consistent with the performance of the best system of emission control, and the company data indicate that this standard would not significantly reduce the length of a normal run for a fluid catalytic cracking unit.

Another approach to establishing a level for the promulgated standard is to statistically analyze the emission data supplied by the company operating facility A. The mean and standard deviation of these data for the full 20-month run are 0.518 and 0.125 kilogram per 1,000 kilograms of coke burn-off in the catalyst regenerator, respectively. Averaging the EPA data on facility A yields a value of 0.646 kilogram per 1,000 kilograms of coke burn-off. The assumption that the data supplied by the company operating facility A are somewhat comparable to EPA's data leads to the additional assumption that the variance and standard deviation of the company data provide an estimate of the variance and standard deviation which might have been observed if EPA had tested facility A over the full 20 months between turnarounds.

Using these assumptions, an estimate can be made of what the level of an emission standard should be to ensure that the standard does not significantly shorten the length of a normal run for a fluid catalytic cracking unit, while also ensuring a level of control consistent with the performance of facility A. If the value of one standard deviation is added to the average of the EPA data for facility A, a value of 0.771 kilogram per 1,000 kilograms of coke burn-off is yielded. Statistically, this implies that if facility A had been tested by EPA over the full 20 months between turnarounds, about 16 percent of the emission data would exceed 0.771 kilogram per 1,000 kilograms of coke burn-off.

If the value of two or three standard deviations is added to the average of the EPA data for facility A, values of 0.896 or 1.021 kilogram per 1,000 kilograms of coke burn-off are yielded. Statistically, this implies that if facility A had been tested by EPA over the full 20 months between turnarounds, about 2.5 percent or 0.15 percent of the emission data would exceed 0.896 or 1.021 kilograms per 1,000 kilograms of coke burn-off.

While the assumptions necessary to support this type of a statistical analysis are subject to question, the exercise does tend to indicate that an emission standard of 1.0 kilogram per 1,000 kilograms of coke burn-off is consistent with the performance of a well-controlled catalyst regenerator over the normal run length of a fluid catalytic cracking unit.

As a result, a standard is promulgated limiting the rate of emission of particulate matter to the atmosphere from fluid catalytic cracking unit catalyst regenerators to no more than 1.0 kilogram per 1,000 kilograms of coke burn-off in the catalyst regenerator.

Exemption of Small Sources

A number of comments were received requesting that small fluid catalytic cracking unit catalyst regenerators be exempted from the standards due to the economic impact that

compliance would impose on small refineries.

Background information considered in proposing the standards for fluid catalytic cracking unit catalyst regenerators included the economic impact of the proposed standards. Essentially, EPA's analysis indicated that the proposed standards would have little or no economic impact on either small (20,000 bbl/day) or large (65,000 bbl/day) fluid catalytic cracking units. However, in light of the comments received, the economic impact of the standards was reexamined.

This analysis of the economic impact of the promulgated standards on fluid catalytic cracking unit catalyst regenerators also indicates that the standards should impose no barriers to growth for small petroleum refineries. Consequently, the promulgated standards apply equally to both small and large fluid catalytic cracking unit catalyst regenerators.

The EPA analysis is included in Appendix C. The economic impact of only the particulate emission standard is examined in this analysis. If the net impact of the carbon monoxide standard and the particulate matter standard is considered, the cost savings generated from steam production in the carbon monoxide boiler more than offset the costs of both the carbon monoxide boiler and the electrostatic precipitator. Although not specifically addressed in Volume 1, this is also the case when in situ combustion of the carbon monoxide in the catalyst regenerator (control system 1 in Figure 4-1), rather than a carbon monoxide boiler, is used to control carbon monoxide emissions. In this case, the cost savings resulting from improved catalyst activity and selectivity, which lead to improved gasoline yields, for example, are more than adequate to offset both the costs associated with in situ combustion and the electrostatic precipitators.

The EPA analysis presented in Appendix C examines not only the economic impact of the standard for fluid catalytic cracking unit catalyst regenerators. It also examines the combined economic impact of this standard, the standard for fuel gas combustion devices, the water quality effluent guidelines for petroleum refineries being developed, and EPA's regulations requiring the reduction of lead in gasoline. Because this analysis was discussed in the previous section concerning the promulgated standard for fuel gas combustion systems, a discussion of the analysis will not be presented here. The reader is referred to either Appendix C or the previous section concerning the promulgated standards for fuel gas combustion devices.

CHAPTER 5. STORAGE VESSELS FOR PETROLEUM LIQUIDS

SUMMARY OF PROMULGATED STANDARD

The promulgated standard applies to storage vessels with capacities greater than 151,412 liters (40,000 gallons) that contain crude petroleum, condensate, or finished or intermediate products of a petroleum refinery. The standard limits hydrocarbon emissions from any such storage vessel by requiring equipment as follows:

1. If the true vapor pressure under actual storage conditions is equal to or greater than 78 mm Hg (1.5 psia), but not greater than 570 mm Hg (11.1 psia), the storage vessel shall be equipped with a floating roof, a vapor recovery system, or their equivalents.
2. If the true vapor pressure under actual storage conditions is greater than 570 mm Hg (11.1 psia), the storage vessel shall be equipped with a vapor recovery system or its equivalent.

DISCUSSION OF PROMULGATED REGULATION

The major revisions in the promulgated regulation may be summarized as follows:

(1) The exemption threshold for tank size was reduced from 245,000 liters (65,000 gallons) to 151,412 liters (40,000 gallons).

(2) Conservation vents are no longer required on storage vessels containing petroleum liquids at a true vapor pressure, as stored, of less than 78 mm Hg (1.5 psia).

(3) Requirements for daily recordkeeping were deleted, and other monitoring requirements were simplified to reduce recordkeeping and to aid enforcement.

(4) Maintenance requirements specific to storage vessels were deleted because the General Provisions of the regulations now require proper maintenance of all affected facilities.

In addition, many revisions that do not change the standard are included in the promulgated regulation. These changes, which primarily consist of clarifying detail to prevent confusion and misinterpretation, are discussed in the following sections.

Affected Facility

The definition of a storage vessel was clarified to specifically exclude high-pressure vessels, subsurface caverns, porous-rock reservoirs, and underground tanks if the total volume of petroleum liquids added to or taken from underground tanks annually does not exceed twice the volume of the tank. As commentators pointed out, these types of storage are optimum for preventing the release of emissions to the atmosphere and need no additional control devices.

The proposed definition of petroleum liquids ("crude petroleum or any derivative thereof") was criticized by several commentators for being so broad that it could be misconstrued. The promulgated definition includes crude petroleum, condensate, and any finished or intermediate products of a petroleum refinery, and excludes certain specified fuel oils. Definitions of petroleum refinery and condensate were added to accommodate these changes in the definition of petroleum liquids.

One commentator wanted the tank size exemption increased to 320,000 liters (84,500 gallons) because this size is most commonly used for storage of diesel fuels and the mixtures of petroleum liquids known as pipeline interfaces. EPA agrees that storage of such low-volatility liquids should be exempt from the standard; rather than increase the tank-size exemption, however, the Agency expanded the definition of petroleum liquids to specifically exclude certain low-volatility diesel fuels. Low-volatility interfaces (less than 78 mm Hg or 1.5 psia) are now exempt from the hydrocarbon standard because conservation vents are no longer required on vessels containing liquids at these pressures.

Many commentators stated that storage of crude oil and condensate at production facilities in the field should be exempt from the standard. EPA intended such storage to be exempt by the selection of the minimum tank size to which the standard would apply. Industry representatives had indicated that the exemption size proposed, 245,000 liters (65,000 gallons), would exempt essentially all of the tanks in the producing field. However, data have since been presented that indicate larger tanks are sometimes used in these locations. The designation of the affected facility was thus revised to explicitly exempt storage of crude petroleum or condensate at producing facilities in the field. The exemption applies to storage between the time that the oil and condensate are removed from the ground and the time that custody of these products is transferred from the well or producing operations to the transportation operations. Producing field storage is exempt because the low level of emissions, the relatively small size of these tanks, and their commonly remote locations do not justify the switch from the bolted-construction, fixed-roof tanks in common use to the welded-construction, floating-roof tanks that would be required for new sources to comply with the standards.

The standard as originally conceived was to apply to tanks with capacities greater than 40,000 gallons in order to be consistent with existing State and local regulations. As previously stated, the tank-size exemption for the proposed standard was instead set at 65,000 gallons in order to exempt storage of crude oil and condensate in the field. Because the promulgated standard now specifically exempts such storage, the minimum exemption size has been reduced from 65,000 gallons to 40,000 gallons. Of the total number of storage vessels to which the standard applies, only 2 percent will be affected by this exemption size reduction.

Two definitions were added to the regulation as a result of the addition of the exemption for storage of crude oil and condensate in the field. The definition of a drilling and production facility lists the equipment covered by the exemption, and custody transfer is defined to specify the point at which the exemption no longer applies.

The Standard

The proposed standard required the use of a conservation vent or its equivalent on storage vessels containing petroleum products with a true vapor pressure at actual storage conditions of less than 78 mm Hg (1.52 psia). Several commentators pointed out, and EPA agrees, that certain stocks can cause serious operating problems by fouling the conservation vents, that these vents are frequently locked open or removed in winter to prevent freezing, and that the beneficial effects of these vents on emissions are minimal. This requirement was deleted from the promulgated standard.

Vapor recovery systems are cited in the standard as satisfactory control devices for emissions from petroleum liquids stored at certain specified conditions. Several commentators objected to the definition of a vapor recovery system because the wording ("disposal system . . . to prevent . . . emission to the atmosphere") could be interpreted as demanding 100 percent recovery. EPA recognizes that recovery efficiencies will vary according to climate and the types and concentrations of the vapors processed, and has deliberately not required a specific level of efficiency. Control systems which are capable of providing an equivalent amount of control of hydrocarbon emissions may be used in lieu of the systems specified by the standard. An example of an equivalent control system is one which incinerates with an auxiliary fuel the hydrocarbon emissions from the storage tank before such emissions are released into the atmosphere.

At the suggestion of several commentators, the definition of floating roof, another control option specified in the standard, was extended to include covered floating roofs and internal floating covers.

Monitoring

Over half of the comments received concerning storage vessels contained objections to various aspects of the proposed monitoring regulation, particularly the portion that required daily records of transfer operations, tank temperatures, and true vapor pressures. In a large, modern petroleum refinery, which was the type of operation used as a basis for the standard, these items could be recorded and filed with little difficulty. Many of the commentators, however, validly argued that such files would be an unjustifiable recordkeeping burden on remote tank farms, terminals, and marketing operations; the monitoring requirements have been revised to eliminate the requirements for daily recordkeeping.

Other monitoring requirements have been relaxed as well. The proposed regulation required owners or operators of storage vessels containing petroleum liquids at specified pressures to provide, in addition to the daily records, monthly summaries of the types of liquids stored, quantity transferred, bulk temperatures, and true vapor pressures. Under the promulgated regulation, all owners or operators of any storage vessels subject to the standard must only maintain a file on types of liquids stored, typical Reid vapor pressures of each, dates of storage, and dates on which the vessel is empty. Average monthly storage temperatures and true vapor pressures are also required for liquids at certain specified storage conditions. The simplified monitoring regulation will aid both operators and enforcement officials by reducing paperwork without sacrificing the objectives of the standard.

A definition of Reid vapor pressure was added to the regulations in accordance with the changes in the monitoring requirements.

Maintenance

Comments received indicated that the maintenance requirements were not feasible because they were not specific enough. In addition, a revision to the General Provisions (subpart A, 40 CFR 60) requires all affected facilities to be operated and maintained in a manner consistent with good air pollution control practice for minimizing emissions. This provision will ensure good maintenance practices, which was the purpose of the proposed maintenance requirements for storage vessels. Maintenance requirements specific to storage vessels were thus deleted.

CHAPTER 6. SECONDARY LEAD SMELTERS AND REFINERIES

SUMMARY OF PROMULGATED STANDARDS

The promulgated standards of performance for secondary lead smelters and refineries limit emissions of particulate matter from blast (cupola) and reverberatory furnaces as follows:

1. No more than 50 mg/dscm (0.022 gr/dscf).
2. Less than 20 percent opacity.

Visible emissions from any pot furnace with a charging capacity of more than 250 kilograms (550 pounds) shall be less than 10 percent opacity. Visible emissions caused solely by the presence of uncombined water are not subject to the opacity standards.

DISCUSSION OF PROMULGATED REGULATION

No substantial changes have been made to the proposed concentration standard for secondary lead smelters and refineries. However, some minor rewording and reorganization changes that do not change the standard are included in the promulgated regulations.

To avoid repetition, the provision covering emission-records requirements, the definition of particulate matter, and the provision prohibiting the use of dilution air were removed from individual regulations and incorporated in the General Provisions, which are applicable to all sources. The paragraph concerning dilution air has also been revised to clarify misunderstandings evidenced by comments received during the public comment period. Other clarifications include: (1) deletion of "normal" from the particulate concentration standard to avoid confusion between "normal" and "standard," (2) substitution of a more specific statement of conditions under which performance tests will be conducted, and (3) deletion of a confusing and repetitive statement concerning the date upon which the standard becomes applicable. Several other changes, made to clarify EPA's intent, were incorporated in the test methods and procedures. These include a revision of the sampling time specified for performance testing, and inclusion of an exception to the promulgated procedures to make clear EPA's recognition that process variables may interfere with specified sampling conditions.

Because these changes in the regulations apply to nearly all of the sources for which standards are promulgated, the rationale for changes is presented in Chapter 2, General Considerations, of this volume.

A minor revision, the removal of the 2-minute-per-hour exemption from the opacity standards, has been made to the regulation for secondary lead smelters and refineries. This revision is based on new data, reevaluation of the data collected before proposal of the regulation, and the separate promulgation of exemptions from opacity standards during periods of startup, shutdown, or malfunction.

Comments were received on both the opacity limit and the time exemption provisions of the proposed regulation. Additional data were obtained during 9 hours of continuous observations at one plant that met the concentration standard of 50 mg/dscm. Two qualified observers visually determined the opacity of emissions from one reverberatory furnace and one blast furnace vented to the same stack. During these 9 hours, the only visible emissions were at 5 percent opacity for 90 seconds and at 20 to 100 percent opacity for 17 minutes. The emissions at 20 to 100 percent opacity were caused, respectively, by a hole in a bag and by the bypassing of an entire section of the baghouse. These two circumstances are considered malfunctions, and opacity standards do not apply during periods of malfunction. (See the regulations recently promulgated in the Federal Register of October 15, 1973, 38 FR 28564, which exempt from opacity standards any emissions generated during startups, shutdowns, or malfunctions.) The new data provide information consistent with the summaries of source tests submitted to EPA by the Los Angeles County Air Pollution Control District under contract no. 2PO-68-02-3326. The Los Angeles County data, used as part of the basis for the proposed standard, were obtained from four plants that met the concentration standard. Emissions from three blast furnaces and one reverberatory furnace were observed for a total of 4 hours and no visible emissions were detected.

The proposed 2-minute time exemption was not based on observed increases in opacity, but was an arbitrary selection of time intended to prevent uncontrollable short-term emissions from constituting violations. The exemptions now provided by the promulgated startup-shutdown-malfunction regulations cover circumstances specific to the source. The data show that the promulgated opacity limit of less than 20 percent allows minor variations and that there are no operating circumstances or process variables that would require exemptions in addition to those provided by the startup-shutdown-malfunction regulations.

In the judgment of the Administrator, these data show that the promulgated (and proposed) opacity limit is sufficiently close to observed opacity to ensure proper operation and maintenance of the process and collection equipment, and that the limit, coupled with the exemptions for startups, shutdowns, and malfunctions, constitutes an opacity standard that is not more restrictive than the concentration standard. A general discussion of the intent of opacity standards and the issues involved in setting them is included in Chapter 2 of this volume.

CHAPTER 7. SECONDARY BRASS AND BRONZE INGOT PRODUCTION PLANTS

SUMMARY OF PROMULGATED STANDARDS

The promulgated standards of performance for secondary brass or bronze ingot production plants limit emissions of particulate matter from reverberatory furnaces having production capacities of 1,000 kg (2,205 lb) or greater as follows:

1. No more than 50 mg/dscm (0.022 gr/dscf).
2. Less than 20 percent opacity.

Visible emissions from any electric furnace of 1,000 kg (2,205 lb) or greater production capacity or from any blast (cupola) furnace of 250 kg/hr (550 lb/hr) or greater capacity shall not exhibit 10 percent opacity or greater. Visible emissions caused solely by the presence of uncombined water are not subject to the opacity standards.

DISCUSSION OF PROMULGATED REGULATION

No substantial changes have been made to the proposed concentration standard for secondary brass and bronze ingot production plants. However, some minor rewording and reorganization changes that do not change this standard are included in the promulgated regulations.

To avoid repetition, the provision covering emission-records requirements, the definition of particulate matter, and the provision prohibiting the use of dilution air were removed from individual regulations and incorporated in the General Provisions, which are applicable to all sources. The paragraph concerning dilution air has also been revised to clarify misunderstandings evidenced by comments received during the public comment period. Other clarifications include: (1) deletion of "normal" from the particulate concentration standard to avoid confusion between "normal" and "standard," (2) substitution of a more specific statement of conditions under which performance tests will be conducted, and (3) deletion of a confusing and repetitive statement concerning the date upon which the standard becomes applicable. Several other changes, made to clarify EPA's intent, were incorporated in the test methods and procedures. These include a revision of the sampling time specified for performance testing, and inclusion of an exception to the promulgated procedures to make clear EPA's recognition that process variables may interfere with specified sampling conditions.

Because these changes in the regulations apply to nearly all of the sources for which standards are promulgated, the rationale for changes is presented in Chapter 2, General Considerations, of this volume.

Change in the Opacity Standards

The opacity standards for brass and bronze ingot production plants have been revised to reflect new data, reevaluation of the data collected before proposal of the regulation, and the separate promulgation of regulations which exempt from opacity standards any emissions generated during periods of startup, shutdown, or malfunction (see Federal Register of October 15, 1973, 38 FR 28564).

In response to comments received during the public comment period, additional data were obtained from two well-controlled reverberatory furnaces. The first of these furnaces, controlled by a baghouse, was source-tested during the development of the proposed standard and found to meet the concentration limit. The opacity of emissions from this baghouse was determined visually by two qualified observers. Observations, made continuously for 4 hours, showed that emissions from the baghouse varied from 0 to 10 percent opacity. All observations were made during the refining process--that portion of the ingot production cycle judged by EPA and by plant operators to cause the greatest amount of the most visible emissions. In addition, the particulate concentration to the baghouse was considered to be high because a large percentage of zinc was present in the scrap. The furnace was being used to oxidize the zinc so that it would be removed as zinc oxide in the ventilation gases ducted to the baghouse. Thus, even under heavy load conditions, this baghouse easily met the promulgated opacity standard.

The second plant was tested continuously for 5 hours, also by two qualified observers, and similar data were obtained. Observations were made of emissions from a baghouse controlling both a blast (cupola) furnace and a reverberatory furnace. This baghouse was also source-tested during the development of the proposed standard, but malfunctions invalidated the data obtained, and no judgment was made as to whether this baghouse could meet the concentration standard. As in the plant above, emissions varied from 0 to 10 percent opacity.

The proposed 2-minute time exemption was not based on observed increases in opacity, but was an arbitrary selection of time intended to prevent uncontrollable short-term emissions from constituting violations. The exemptions now provided by the promulgated startup-shutdown-malfunction regulations cover circumstances specific to the source. The data show that the promulgated opacity limit of less than 20 percent allows minor variations and that there are no operating circumstances or process variables that would require exemptions in addition to those provided by the startup-shutdown-malfunction regulations.

In the judgment of the Administrator, these data show that the promulgated opacity limit is sufficiently close to observed opacity to ensure proper operation and maintenance of the process and collection equipment, and that the limit, coupled with the exemptions for startups, shutdowns, and malfunctions, constitutes an opacity standard that is not more restrictive than the concentration standard. A general discussion of the intent of opacity standards and the issues involved in setting them is included in Chapter 2 of this volume.

CHAPTER 8. IRON AND STEEL PLANTS

SUMMARY OF PROMULGATED STANDARD

The promulgated standard of performance for iron and steel plants limits emissions of particulate matter from basic oxygen process furnaces to no more than 50 mg/dscm (0.022 gr/dscf).

DISCUSSION OF PROMULGATED REGULATION

Some minor rewording and reorganization that do not change the standard are included in the promulgated regulations. The proposed opacity standard covering iron and steel plants has been withdrawn for further study. Comments received pointed out the inappropriateness of the proposed standard (10 percent opacity except for 2 minutes each hour) for this cyclic steel-making process. The separate promulgation of regulations (see Federal Register of October 15, 1973, 38 FR 28564) which provide exemptions from opacity standards during periods of startup, shutdown, and malfunction added another dimension to the problem, and the collection of new data shows variations in opacity for reasons not yet well enough identified.

To avoid repetition, the provision covering emission-records requirements, the definition of particulate matter, and the provision prohibiting the use of dilution air were removed from individual regulations and incorporated in the General Provisions, which are applicable to all sources. The requirement concerning dilution air has been removed from this regulation and dealt with as a general provision (subpart A) applicable to all sources to clarify misunderstandings evidenced by comments received during the public comment period. Other clarifications include: (1) deletion of "normal" from the particulate concentration standard to avoid confusion between "normal" and "standard," (2) substitution of a more specific statement of conditions under which performance tests will be conducted, and (3) deletion of a confusing and repetitive statement concerning the date upon which the standard becomes applicable. Several other changes, made to clarify EPA's intent, were incorporated in the test methods and procedures. These include a revision of the sampling time specified for performance testing, and inclusion of an exception to the promulgated procedures to make clear EPA's recognition that process variables may interfere with specified sampling conditions.

Because these changes in the regulations apply to nearly all of the sources for which standards are promulgated, the rationale for these changes is presented in Chapter 2, General Considerations, of this volume.

CHAPTER 9. SEWAGE TREATMENT PLANTS

SUMMARY OF PROMULGATED STANDARDS

The promulgated standards of performance for sewage treatment plants limit particulate emissions from sludge incinerators at municipal sewage treatment plants as follows:

1. No more than 0.65 g/kg dry sludge input (1.30 lb/ton dry sludge input).
2. Less than 20 percent opacity.

Visible emissions caused solely by the presence of uncombined water are not subject to the opacity standard.

DISCUSSION OF PROMULGATED REGULATION

The major changes from the proposed to the promulgated regulation are:

1. The standard is now based on units of mass rather than on the proposed units of concentration.
2. The opacity standard was changed from the proposed limit of less than 10 percent except for 2 minutes in any 1 hour to less than 20 percent.
3. To accommodate the change of units, the section on test methods was revised and a section on monitoring requirements was added.

Some minor rewording and reorganization changes that do not change the standard are also included in the promulgated regulation. For example, the designation of the affected facility was clarified and several definitions were deleted. To avoid repetition, the provision covering emission-records requirements and the definition of particulate matter were removed from individual regulations and incorporated into the General Provisions, which are applicable to all sources.

Change of Units for the Standard

Emission limits were proposed in terms of concentration (mg/Nm^3). Sludge incineration, like most combustion processes, requires more air than is actually used in the combustion process. This "excess air" promotes combustion, but the amount of excess air used varies significantly from plant to plant. In addition, gases from a multiple-hearth incinerator are often diluted with shaft cooling air upstream of the sampling point. Both excess air and shaft cooling air dilute the gases discharged to the atmosphere and thereby decrease particulate concentration.

EPA studied these problems prior to proposal of the regulation and concluded that a concentration standard would still be acceptable for the following reasons:

Excess air - Sludge incineration is not self-sustaining at the temperatures desired and auxiliary fuel must be used. Excess air absorbs heat, increasing auxiliary fuel requirements. The volume of gases which must be treated by the scrubber also increases. Economics, then, encourages operation at the lowest feasible level of excess air.

Shaft cooling air (multiple-hearth incinerators only) - Since shaft cooling air bypasses the incinerator and the scrubber, economics does not limit the use of this air as a diluent. A provision was written into the regulation to solve this problem by requiring that the amount of such dilution be determined by the owner or operator. The results would then be corrected to an undiluted basis.

Comments on the proposed regulations and additional discussions with industry experts have revealed two difficulties with this approach.

First, dilution does occur and is significant. Percent CO_2, an inverse function of excess air, averaged 12.3 percent on a fluidized-bed incinerator and 10.1 percent on a multiple-hearth incinerator during EPA tests. This means that if the two incinerators were discharging the same quantity (pounds per hour) of particulate matter, the concentration of particulate matter in the gases from the multiple-hearth incinerator would be approximately 20 percent less than the concentration in the gases from the fluidized-bed unit because of the difference in the amount of air dilution.

Second, the control devices normally used on sludge incinerators--wet scrubbers--absorb some of the CO_2 present in the gases discharged to the atmosphere. This, as well as the CO_2 contributed by auxiliary fuel, alters the gas composition and precludes the relatively simple correction of results to a reference basis such as 12 percent O_2. Determination of the amount of dilution could then prove difficult. Gas velocity determination, the most practical alternative to CO_2 correction, is of use only when dilution air is added following the incinerator. It can seldom be used to determine the amount of excess air, and its use in determining shaft cooling air or other dilution is limited by the need for simultaneous traverses and/or unfavorable ductwork configurations. Introduction of shaft cooling air would be prohibited prior to the sampling site, but such regulation would not affect excess air and auxiliary fuel variations.

Expressing the standard in mass units of grams particulate per kilogram of dry sludge fed to the incinerator (g/kg) avoids the above problems. Data from the incinerators tested are presented in terms of mass in Figure 9-1. The test results shown in this figure are far different in relation to the standard and to each other than are the results shown in terms of concentration in Volume 1 of this series

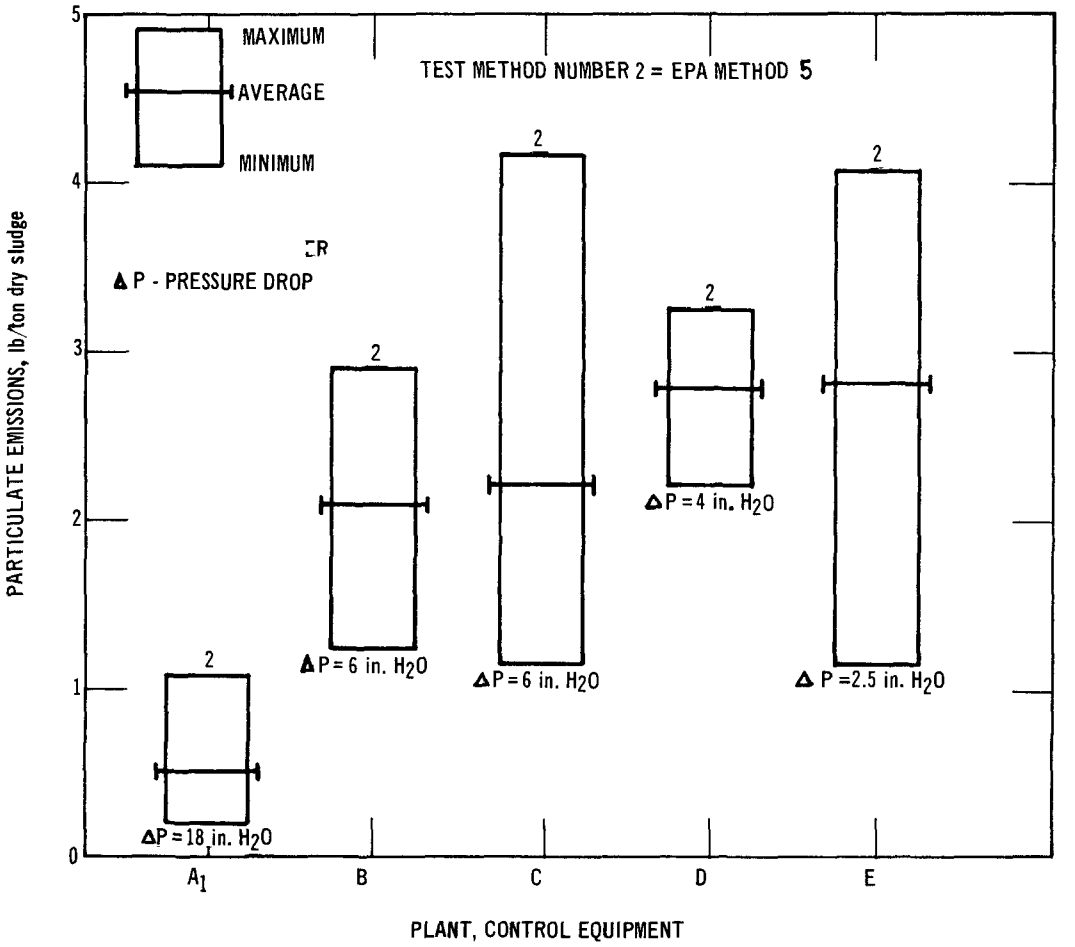

Figure 9-1. Particulate emissions from sludge incinerators at sewage treatment plants.

of documents. For example, the test results in terms of concentration indicate that Plant C almost meets the proposed standard, but these same results converted to mass units show that Plant C does not come close to meeting the promulgated standard. Differences of this type are attributable to the various amounts of combustion air used in the individual plants. Test results are thus unaffected by either dilution or combustion air volume when expressed in terms of mass.

Average values of Plant A test results were used to convert the proposed standard (70 mg/Nm^3 or 0.03 gr/dscf) to mass units:

$$0.031 \text{ gr/dscf (proposed NSPS)} \times \frac{0.481 \text{ lb/ton (Plant A avg.)}}{0.011 \text{ gr/dscf (Plant A avg.)}} = 1.30 \text{ lb/ton or } 0.65 \text{ g/kg}$$

Thus, the level of control required by the standard is unaffected; only the units have been changed.

The new units require determination of dry sludge feed rate (input). The promulgated regulation details the information needed, usually only two items: liquid sludge flow rate and dry sludge weight per unit volume of liquid sludge.

Change in the Opacity Standard

The opacity standard covering sewage treatment plants has been revised to reflect new information obtained on a well-controlled plant and to reflect the recently promulgated regulations which exempt from opacity standards any emissions generated during periods of startup, shutdown, or malfunction (see Federal Register of October 15, 1973, 38 FR 28564).

New data were obtained from a well-controlled sludge incinerator. This incinerator was the one previously tested by EPA that met the promulgated process weight standard. The opacity of emissions from this incinerator was determined visually by two qualified observers during 6.25 hours of continuous observation. The only visible emissions observed were for 45 seconds at 10 percent opacity and for 35 minutes at 5 percent opacity.

The proposed 2-minute time exemption was not based on observed increases in opacity, but was an arbitrary selection of time intended to prevent uncontrollable short-term emissions from constituting violations. The exemptions now provided by the startup-shutdown-malfunction regulations cover circumstances specific to the source. The data show that the promulgated opacity limit of less than 20 percent allows minor variations and that there are no operating circumstances or process variables that would require exemptions in addition to those provided by the startup-shutdown-malfunction regulations.

In the judgment of the Administrator, these data show that the promulgated opacity limit is sufficiently close to observed opacity to ensure proper operation and maintenance of the process and collection equipment, and that the limit, coupled with the exemptions during startups, shutdowns, and malfunctions, constitutes an opacity standard that is not more restrictive than the concentration standard. A general discussion of the intent of opacity standards and the issues involved in setting them is included in Chapter 2 of this volume.

Emission Test Conditions

Three of the five plants tested by EPA (Plants B, C, and E) operated at sludge burning rates far below the design rate during the tests. These low burning rates, as one commentator pointed out, result in gas flow through a multiple-hearth incinerator system at rates below those for which the scrubbers were designed. The low gas flow rates adversely affect scrubber efficiency unless the control device, e.g., a venturi scrubber with an adjustable throat, can compensate for changes in flow. However, tabulation of the results from Plants B through E (all equipped with impingement-type scrubbers) shows no relationship between mass emissions and percent of rated capacity (Table 9-1). Instead, mass emissions from these facilities appear strongly dependent on pressure drop across the scrubber (Table 9-2). Why, though, is there little or no effect at decreased burning capacity? One manufacturer* suggests that, for multiple-hearth furnaces, the decrease in gas flow rate results in less entrainment of fly ash. Therefore, the amount of particulate matter entering the scrubber is less. The two changes cancel each other out, and the mass emission rate remains fairly constant over a wide range of feed rates.

For fluidized-bed incinerators, operating conditions are more rigid. Gas flow rate must be high enough to keep the sand fluid, so it cannot be decreased at lower feed rates. Both fluidized-bed units tested by EPA operated at nearly 100 percent capacity during the tests, so the effect of reduced feed rates is not known, but the necessity of maintaining a fluidized bed, in the Administrator's best judgment, precludes operating these units at gas flow rates that would adversely affect control device efficiency.

*Telephone communication with Mr. Mark Helms, Envirotech Corp., Menlo Park, CA 94025. September 18, 1973.

Table 9-1. RELATIONSHIP OF OPERATING AT LESS THAN RATED CAPACITY TO MASS EMISSIONS FROM IMPINGEMENT SCRUBBERS[a]

Plant	Type of incinerator	Operation, % of rated capacity	Mass emissions, lb/ton
D	Fluidized-bed	95	2.77
B	Multiple-hearth	64	2.09
E[b]	Multiple-hearth	50	2.80
C	Multiple-hearth	35	2.21

[a]Plant A's scrubber is a different design (venturi), so Plant A is not included in the table.

[b]Plant E has a cyclonic rather than a plate scrubber, but the efficiency is similar (Scrubber Handbook, Chapter 3).

Table 9-2. RELATIONSHIP OF PRESSURE DROP TO MASS EMISSIONS FROM IMPINGEMENT SCRUBBERS[a]

Plant	Type of incineration	Pressure drop, in. H_2O	Mass emissions, lb/ton
B	Multiple-hearth	6	2.09
C	Multiple-hearth	6	2.21
D	Fluidized-bed	4	2.77
E[b]	Multiple-hearth	2.5	2.80

[a]Plant A's scrubber is a different design (venturi), so Plant A is not included in the table.

[b]Plant E has a cyclonic rather than a plate scrubber, but the efficiency is similar (Scrubber Handbook, Chapter 3).

APPENDIX A. ASPHALT CONCRETE PLANT DATA SUBMITTED AFTER PROPOSAL

The partial or complete stack test reports submitted in response to EPA's request for factual data are presented in this appendix. Test reports were received for 11 wet scrubber-equipped plants, five baghouse-equipped plants, and two venturi scrubber-equipped plants. With one exception, stack tests of the baghouse- and venturi scrubber-equipped plants were done using test procedures in general conformance with EPA method 5. The test results for facility P were considered to be invalid for the reasons indicated in Table A-2. With the exception of the data from the wet scrubber-equipped plants and the data for facility P, all of the average outlet concentrations are summarized in Table 3-2 in Chapter 3. The exhaust gases were analyzed at each plant after they were discharged from the control equipment. These gases included dryer exhaust gases and sweep air used to gather dust at such points in the system as elevators, screens, and scavenger systems. Most of the data for the wet scrubber-equipped plants were collected using the San Bernardino County Air Pollution Control District's test procedure.

EPA also received the final test results for 13 baghouse- or venturi scrubber-equipped plants using valid and known testing procedures, and data showing average outlet concentrations for 25 plants that had unknown control equipment or were tested using unknown test procedures. The data for these 38 plants are summarized in Table 3-1; they are not, however, included in this appendix due to a lack of information necessary to evaluate the data.

Table A-1. Asphalt Concrete Facility O[a]

Run number	1	2	3	Average
Date	4/3/73	4/3/73	4/4/73	
Test time, minutes	144	144	144	144
Production rate, tons/hr	300	315	271	295
Stack Effluent				
Flowrate, dscfm	36,217	36,396	36,675	36,429
Flowrate, dscf/ton product	7267.6	6932.6	8119.9	7409
Temperature, °F	140	145	143	143
Water Vapor, Vol. %	16.7	15.4	14.2	15.4
CO_2, Vol. %	2.2	2.2	2.2	2.2
O_2, Vol. %	17.4	17.4	17.4	17.4
CO, vol. %	—	—	—	—
Visible emissions, % opacity	—	—	—	—
Particulate emissions				
Probe and filter catch				
gr/dscf	0.0297	0.0299	0.0413	0.0336
gr/acf	0.0287	0.0290	0.0407	0.0326
lb/hr	9.21	9.33	12.97	10.50
lb/ton of product	0.0308	0.0296	0.0478	0.0361
Total Catch				
gr/dscf	—	—	—	—
gr/acf	—	—	—	—
lb/hr	—	—	—	—
lb/ton of product	—	—	—	—

[a]Oil-fired (No. 2 diesel oil), 250-tons/hr-capacity plant equipped with a cyclone and a baghouse with a design air-to-cloth ratio of 6-to-1. Plant was operating at capacity during the test periods. Data were provided by the National Asphalt Pavement Association in their public comment.

Table A-2. Asphalt Concrete Facility P[a]

Run number	M	1	2	Average
Date	11/15/72	11/15/72	11/15/72	
Test time, minutes	90	74	62	75.3
Production rate, tons/hr	~250	~250	~250	~250
Stack Effluent				
Flowrate, dscfm	—	—	—	—
Flowrate, dscf/ton product	—	—	—	—
Temperature, °F	192	194	190	192
Water Vapor, vol. %	10.33	9.36	9.59	9.76
CO_2, vol. %	2.2	2.2	2.2	2.2
O_2, vol. %	4.64	4.64	4.64	4.64
CO, vol. %	—	—	—	—
Visible emissions, % opacity	—	—	—	—
Particulate emissions				
Probe and filter catch				
gr/dscf	0.091	0.084	0.098	0.0904
gr/acf				
lb/hr	30.80	28.55	32.63	31.36
lb/ton of product	—	—	—	—
Total Catch				
gr/dscf	—	—	—	—
gr/acf	—	—	—	—
lb/hr	—	—	—	—
lb/ton of product	—	—	—	—

[a]Oil-fired (No. 2 diesel oil), 300-tons/hr-design-capacity plant equipped with a cyclone and a baghouse with a design air-to-cloth ratio of 6-to-1. Plant was operating at about 80 percent capacity during the test periods. Data were provided by the National Asphalt Pavement Association in their public comment. Test results were considered unacceptable because:

(1) the velocity head data suggest that the samples were obtained in a region of turbulent flow, and

(2) the sampling time used at each point was not constant.

Thus, the use of only 10 sample points does not conform to the minimum criteria specified in methods 1 and 2 and places the accuracy of the test data in serious question.

Table A-3. Asphalt Concrete Facility Q[a]

Run number	1	2	Average
Date	10/25/72	10/26/72	
Test time, minutes	54	54	54
Production rate, tons/hr	—	—	—
Stack Effluent			
Flowrate, dscfm	18,700	19,830	19,265
Flowrate, dscf/ton product	—	—	—
Temperature, °F	200	200	200
Water Vapor, vol %	19.0	16.3	17.65
CO_2, vol. %	No Orsat available		
O_2, vol. %	No Orsat available		
CO, vol. %	No Orsat available		
Visible emissions, % opacity	—	—	—
Particulate Emissions			
Probe and filter catch			
gr/dscf	0.0156	0.0189	0.0172
gr/acf	—	—	—
lb/hr	2.50	3.20	2.76
lb/ton of product	—	—	—
Total Catch			
gr/dscf	0.0661	0.0578	0.062
gr/acf	—	—	—
lb/hr	10.59	9.82	9.91
lb/ton of product	—	—	—

[a]Oil-fired (No. 5 grade fuel oil), 100-tons/hr-design-capacity plant equipped with a cyclone and a baghouse with a design air-to-cloth ratio of 6-to-1. Plant was operating at capacity during the test periods. Data were provided by commentator number 97. Plant was tested with a modified EPA train, but the modifications from recommended procedures are considered to be minor.

Table A-4. Asphalt Concrete Facility R[a]

Run number	1	2	3	Average
Date	3/21/73	4/27/73	4/27/73	
Test time, minutes	100	100	110	103
Production rate,				
tons/hr	—	—	—	—
Stack Effluent				
Flowrate, dscfm	23,464	22,904	22,904	23,091
Flowrate, dscf/ton of product	—	—	—	—
Temperature, °F	219	256	255	243
Water Vapor, vol. %	14.4	25.7	25.7	21.9
CO_2, vol. %	2.5	3.5	3.5	3.2
O_2, vol. %	16.5	11.5	11.5	13.2
CO, vol. %	—	—	—	—
Visible emissions, % opacity	—	—	—	—
Particulate emission				
Probe and filter catch				
gr/dscf	0.009	0.017	0.0203	0.0138
gr/acf	0.0072	0.0124	0.0149	0.0104
lb/hr	1.86	3.28	3.95	2.73
lb/ton of product	—	—	—	—
Total Catch				
gr/dscf	0.0476	0.0366	0.0282	0.0404
gr/acf	0.0366	0.0267	0.0206	0.0301
lb/hr	9.41	7.07	5.46	7.24
lb/ton of product	—	—	—	—

[a]Gas-fired, 120-tons/hr-design-capacity plant equipped with a cyclone and a baghouse with a design air-to-cloth ratio of 5-to-1. Plant was operating at 75 percent design capacity during the test periods. Data were provided by a State control agency. Plant was tested with EPA's train. Minor deviations from the recommended procedures occurred, but these should not significantly affect the accuracy of the data.

Table A-5. Asphalt Concrete Facility S[a]

Run number	1	2	3	Average
Date	10/30/72	10/31/72	10/31/72	
Test time, minutes	50	132	60	80.7
Production rate, tons/hr	—	—	—	—
Stack Effluent				
Flowrate, dscfm	24,500	23,800	23,800	24033
Flowrate, dscf/ton of product	—	—	—	—
Temperature, °F	294	300	300	298
Water Vapor, Vol. %	35.9	34.9	34.9	35.2
CO_2, vol. %	3.4	3.8	3.8	3.7
O_2, vol. %	14.9	14.2	14.2	14.4
CO, vol. %	0.6	0.6	0.6	0.6
Visible emissions, % opacity	—	—	—	—
Particulate emissions				
Probe and filter catch				
gr/dscf	0.026	0.017	0.020	0.0198
gr/acf	0.022	0.0114	0.013	.0139
lb/hr	5.46	3.47	4.08	4.08
lb/ton of product	—	—	—	—
Total catch				
gr/dscf	0.049	0.062	0.037	0.048
gr/acf	0.0416	0.0349	0.024	0.034
lb/hr	10.29	10.61	7.55	9.89
lb/ton of product	—	—	—	—

[a]Gas-fired, 240-tons/hr-design-capacity plant equipped with a baghouse. Production during the test periods was 120 tons/hr because the aggregate was extremely wet. Data were provided by a State control agency. Plant was tested using EPA's train. Minor deviations from recommended procedures occurred, but these should not significantly affect the accuracy of the data.

Table A-6. Asphalt Concrete Facility T[a]

Run number	1	2	3	Average
Date	6/14/73	6/14/73	6/15/73	
Test time, minutes	54	54	54	54
Production rate, tons/hr	—	—	—	—
Stack Effluent				
Flowrate, dscfm	24,800	25,500	25,700	25,333
Flowrate, dscf/ton of product				
Temperature, °F	110	110	110	110
Water Vapor, vol. %	9.7	10.1	8.1	9.3
CO_2, vol. %	1.8	1.5	0.6	1.3
O_2, vol. %	18.5	19.5	20.0	19.3
CO, vol. %	<0.1	<0.1	<0.1	<0.1
Visible emissions, % opacity	—	—	—	—
Particulate emissions				
Probe and filter catch				
gr/dscf	0.013	0.011	0.035	0.0208
gr/acf	0.0107	0.0086	0.028	0.0167
lb/hr	2.6	2.2	7.8	4.4
lb/ton of product	—	—	—	—
Total catch				
gr/dscf	0.018	0.015	0.037	0.0242
gr/acf	0.014	0.0116	0.030	0.0194
lb/hr	3.4	3.0	8.4	5.2
lb/ton of product	—	—	—	—

[a]Gas-fired plant equipped with a cyclone and a venturi scrubber operating at 10.5 inches water gauge pressure drop and approximately 15 gallons of water per 1000 scfm of exhaust gases. Production during the test periods was 130 tons/hr. Data were provided by a State control agency. Plant was tested using EPA-recommended procedures.

Table A-7. Asphalt Concrete Facility U[a]

Run number	1	2	Average
Date	1/23/73	1/23/73	
Test time, minutes	72	72	72
Production rate, tons/hr	101.6	93	97.3
Stack Effluent			
Flowrate, dscfm	30,056	29,733	29,895
Flowrate, dscf/ton product	17,750	19,183	18,435
Temperature, °F	96	100.1	98
Water Vapor, vol. %	5.67	6.48	6.08
CO_2, vol. %	No Orsat available		
O_2, vol. %	No Orsat available		
CO, vol. %	No Orsat available		
Visible emissions, % opacity	0	0	0
Particulate emissions			
Probe and filter catach			
gr/dscf	0.0220	0.0179	0.020
gr/acf	—	—	—
lb/hr	5.6	4.56	5.12
lb/ton of product	0.055	0.049	0.053
Total catch			
gr/dscf	0.0286	0.0239	0.0264
gr/acf	—	—	—
lb/hr	7.34	6.06	6.76
lb/ton of product	0.0722	0.065	0.0695

[a]Oil-fired (No. 2 diesel oil), 100-tons/hr-design-capacity plant equipped with a cyclone and a venturi scrubber operating at 14 inches water gauge pressure drop. Plant production during the test periods was approximately at capacity for conditions prevalent at the time of the test. Data were provided by a local control agency. Plant was tested using EPA train and the results are accepted as being reasonably valid. Lack of field data precluded complete evaluation of the accuracy and representativeness of the test data.

Table A-8. Asphalt Concrete Facility V[a]

Run number	1
Date	8/24/73
Test time, minutes	unknown
Production rate, tons/hr	200
Stack Effluent	
Flowrate, dscfm	27,240
Flowrate, dscf/ton of product	8172
Temperature, °F	130
Water vapor, vol. %	Not available
CO_2, vol. %	No Orsat available
O_2, vol. %	No Orsat available
CO, vol. %	No Orsat available
Visible emissions, % opacity	—
Particulate emissions	
Probe and filter catch	
gr/dscf	—
gr/acf	—
lb/hr	—
lb/ton of product	—
Total catch	
gr/dscf	0.0644
gr/acf	—
lb/hr	15.1
lb/ton of product	0.0755

[a]Gas-fired, 360 tons/hr-design-capacity plant equipped with a cyclone and a wet scrubber. Plant was operating at less than 50 percent of design capacity during the test. Data were provided by a local control agency. Test is unacceptable because of cyclonic and turbulent flows in the gas stream.

Table A-9. Asphalt Concrete Facility W[a]

Run number	1
Date	4/13/72
Test time, minutes	60
Production rate, tons/hr	275
Stack Effluent	
Flowrate, dscfm	32,900
Flowrate, dscf/ton of product	7178
Temperature, °F	142
Water vapor, vol. %	17.1
CO_2, vol. %	No Orsat available
O_2, vol. %	No Orsat available
CO, vol. %	No Orsat available
Visible emissions, % opacity	—
Particulate emissions	
Probe and filter catch	
gr/dscf	—
gr/acf	—
lb/hr	—
lb/ton of product	—
Total catch	
gr/dscf	0.0455
gr/acf	0.0377
lb/hr	13.2
lb/ton of product	0.048

[a]Approximately 320-tons/hr-design-capacity plant equipped with a cyclone and a wet fan. Production during test was 275 tons/hr. Plant operating parameters are unknown. Data were provided by a local control agency.

Table A-10. Asphalt Concrete Facility X[a]

Run number	1	2
Date	1/4/73	1/4/73
Test time, minutes	unknown	unknown
Production rate, ton/hr	200	200
Stack Effluent		
Flowrate, dscfm	82,000	80,154
Flowrate, dscf/ton of product	24,600	24,046
Temperature, °F	125	125
Water vapor, vol. %	Not available	Not available
CO_2, vol. %	No Orsat available	
O_2, vol. %	No Orsat available	
CO, vol. %	No Orsat available	
Visible emissions, % opacity	10	10
Particulate emissions		
Probe and filter catch		
gr/dscf	—	—
gr/acf	—	—
lb/hr	—	—
lb/ton of product	—	—
Total catch		
gr/dscf	0.0237	0.0286
gr/acf	—	—
lb/hr	16.2	19.5
lb/ton of product	0.081	0.0975

[a]Plant was equipped with two primary cyclones, a multiple wet scrubber, and a wet fan. Production during test was 200 tons/hr. Data were provided by a local control agency.

Table A-11. Asphalt Concrete Facility Y[a]

Run number	1	2
Date	11/9/72	11/9/72
Test time, minutes	unknown	unknown
Production rate, tons/hr	270	?
Stack Effluent		
Flowrate, dscfm	50,200	37,200
Flowrate, dscf/ton of product	11,156	—
Temperature, °F	125	125
Water vapor, vol. %	Not available	Not available
CO_2, vol. %	No Orsat available	
O_2, vol. %	No Orsat available	
CO, vol. %	No Orsat available	
Visible emissions, % opacity	—	—
Particulate emissions		
Probe and filter catch		
gr/dscf	—	—
gr/acf	—	—
lb/hr	—	—
lb/ton of product	—	—
Total catch		
gr/dscf	0.0045	0.015
gr/acf	—	—
lb/hr	1.93	4.98
lb/ton of product	0.007	—

[a]Plant was equipped with two primary cyclones (in parallel), two multiple wet scrubbers (in series), and a wet fan. Production during the test was 270 tons/hr. Data were provided by a local control agency.

Table A-12. Asphalt Concrete Facility Z[a]

Run number	1
Date	11/16/71
Test time, minutes	unknown
Production rate, tons/hr	100
Stack effluent	
Flowrate, dscfm	62,175
Flowrate, dscf/ton of product	37,305
Temperature, °F	115
Water vapor, vol. %	—
CO_2, vol. %	1.5
O_2, vol. %	17.0
CO, vol. %	—
Visible emissions, % opacity	0
Particulate emissions	
Probe and filter catch	
gr/dscf	—
gr/acf	—
lb/hr	—
lb/ton of product	—
Total catch	
gr/dscf	0.0217
gr/acf	—
lb/hr	11.56
lb/ton of product	0.1156

[a]Plant was equipped with a large-diameter primary cyclone, three wet scrubbers (in series), and a wet fan. Production during the test was 100 tons/hr. Data were provided by a local control agency.

Table A-13. Asphalt Concrete Facility AA[a]

Run number	1	2
Date	7/16/71	7/19/71
Test time, minutes	unknown	unknown
Production rate, tons/hr	250	250
Stack Effluent		
Flowrate, dscfm	38,719	34,673
Flowrate, dscf/ton of product	9293	8322
Temperature, °F	135	135
Water vapor, vol. %	unknown	unknown
CO_2, vol. %	2.5	3.0
O_2, vol. %	—	—
CO, vol. %	—	—
Visible emissions, % opacity	< 5	< 5
Particulate emissions		
Probe and filter catch		
gr/dscf	—	—
gr/acf	—	—
lb/hr	—	—
lb/ton of product	—	—
Total catch		
gr/dscf	0.011	0.004
gr/acf	—	—
lb/hr	3.48	1.07
lb/ton of product	0.014	0.004

[a]Plant's design capacity is 250 tons/hr. Plant was equipped with a cyclone, three wet scrubbers (in series), and a wet fan. Production during the test was at maximum capacity. Data were provided by a local control agency.

Table A-14. Asphalt Concrete Facility BB[a]

Run number	1	2	3	Average
Date	3/5/73	3/5/73	3/5/73	
Test time, minutes	unknown	unknown	unknown	—
Production rate, tons/hr	144	144	144	144
Stack Effluent				
Flowrate, dscfm	15,156	14,710	15,974	15,280
Flowrate, dscf/ton of product	6315	6129	6656	6367
Temperature, °F	131	138	140	136
Water vapor, vol. %	23.7	29.5	24.6	25.9
CO_2, vol. %	No Orsat available			
O_2, vol. %	No Orsat available			
CO, vol. %	No Orsat available			
Visible emissions, % opacity	—	—	—	—
Particulate emissions				
Probe and filter catch				
gr/dscf	0.0324	0.0465	0.0549	0.0446
gr/acf	—	—	—	—
lb/hr	4.21	5.86	7.52	5.86
lb/ton of product	0.0293	0.0408	0.0523	0.0408
Total catch				
gr/dscf	—	—	—	—
gr/acf	—	—	—	—
lb/hr	—	—	—	—
lb/ton of product	—	—	—	—

[a]Plant was equipped with a skimmer for primary control, a wet pre-scrubber, a wet fan, and a wet cyclonic scrubber. Production during the test was 144 tons/hr. Data were provided by commentator number 11.

Table A-15. Asphalt Facility CC[a]

Run Number	1
Date	4/6/72
Test time, minutes	unknown
Production rate, tons/hr	200
Stack Effluent	
Flowrate, dscfm	29,479
Flowrate, dscf/ton of product	8844
Temperature, °F	120
Water Vapor, Vol. %	—
CO_2, vol. %	No Orsat available
O_2, Vo. %	No Orsat available
CO, vol. %	No Orsat available
Visible emissions, % opacity	—
Particulate emissions	
Probe and filter catch	
gr/dscf	—
gr/acf	—
lb/hr	—
lb/ton of product	—
Total catch	
gr/dscf	0.047
gr/acf	—
lb/hr	11.8
lb/ton of product	0.059

[a]Gas-fired, 200-tons/hr-design-capacity plant equipped with a cyclone and three wet scrubbers installed in series. Data were provided by a local control agency.

Table A-16. Asphalt Concrete Facility DD[a]

Run number	1	2	3
Date	12/19/72	12/19/72	12/20/72
Test time, minutes	60	60	60
Production rate, tons/hr	253	253	253
Stack Effluent			
Flow rate, dscfm	27,800	27,800	26,100
Flow rate, dscf/ton of product	6,593	6,593	6,190
Temperature, °F	155	155	160
Water vapor, vol. %	32.0	30.5	32.8
CO_2, vol. %	4.0	4.0	4.4
O_2, vol. %	14.3	14.2	10.4
CO, vol. %	0.9	0.8	2.2
Visible emissions, % opacity	-	-	-
Particulate emissions			
Probe and filter catch			
gr/dscf	0.061	0.059	0.106
gr/acf	-	-	-
lb/hr	14.5	14.1	23.7
lb/ton of product	0.057	0.056	0.094
Total catch			
gr/dscf	0.062	0.060	0.107
gr/acf	-	-	-
lb/hr	14.8	14.3	23.9
lb/ton of product	0.058	0.057	0.094

[a]Gas-fired plant equipped with a cyclone, a wet cyclone, and a wet fan. Production rate during the test period was 253 tons/hr. Data were provided by a State control agency.

Table A-17. Asphalt Concrete Facility EE[a]

Run number	1	2	3
Date	10/6/72	10/6/72	10/6/72
Test time, minutes	42.5	28	50
Production rate, tons/hr	150	150	150
Stack effluent			
Flow rate, dscfm	18,420	18,420	18,420
Flow rate, dscf/ton of product	7,368	7,368	7,368
Temperature, °F	125	125	125
Water vapor, vol. %	16.8	17.6	18.5
CO_2, vol. %	2.6	2.6	2.6
O_2, vol. %	17.0	17.0	17.0
CO, vol. %	<0.1	<0.1	<0.1
Visible emissions, % opacity	-	-	-
Particulate emissions			
Probe and filter catch			
gr/dscf	0.098	0.117	0.131
gr/acf	-	-	-
lb/hr	15.5	18.5	20.7
lb/ton of product	0.103	0.123	0.138
Total catch			
gr/dscf	0.099	0.122	0.134
gr/acf	-	-	-
lb/hr	15.6	19.3	21.2
lb/ton of product	0.104	0.129	0.141

[a]Gas-fired plant equipped with a cyclone, a wet fan, and a low-energy scrubber. Production during the test was 150 tons/hr. Data were provided by a State control agency.

Table A-18. Asphalt Concrete Facility FF[a]

Run number	1	2	3
Date	11/14/72	11/14/72	11/14/72
Test time, minutes	46.4	48.2	17.3
Production rate, tons/hr	106	106	-
Stack effluent			
Flow rate, dscfm	15,300	15,900	15,900
Flow rate, dscf/ton of product	8,660	9,000	-
Temperature, °F	112	120	120
Water vapor, vol. %	16.5	21.8	22.6
CO_2, vol. %	2.4	2.4	3.0
O_2, vol. %	16.6	16.6	16.2
CO, vol. %	<0.1	<0.1	0.2
Visible emissions, % opacity	-	-	-
Particulate emissions			
Probe and filter catch			
gr/dscf	0.100	0.093	0.121
gr/acf	-	-	-
lb/hr	13.1	12.7	16.5
lb/ton of product	0.124	0.120	-
Total catch			
gr/dscf	0.103	0.100	0.124
gr/acf	-	-	-
lb/hr	13.5	13.6	16.9
lb/ton of product	0.127	0.128	-

[a]Gas-fired plant equipped with a cyclone and a wet scrubber. Production during test was 106 tons/hr. Data were provided by a State control agency.

APPENDIX B. THE ECONOMIC IMPACT OF NEW SOURCE PERFORMANCE STANDARDS UPON THE ASPHALT CONCRETE INDUSTRY

I. ECONOMIC PROFILE

A. Industry Structure

In 1970, there were 1 846 asphalt concrete firms operating an estimated 4,500 plants in the United States.[7] Approximately one-third of the firms operated a single plant and most of the remainder operated less than five plants.

Integration of activities varies widely from firm to firm. Table B-1 shows the percentage of firms involved in activities that are supplemental to asphalt batching.

About 75 percent of the plants are permanently installed while the remainder are considered portable. Permanent plants are primarily located in urban areas where there is a continuing market for new paving and resurfacing work. Portable plants are usually involved in highway paving projects. These plants may be disassembled and relocated to shorten hauling distances as highway construction proceeds.

Plant capacities generally fall within the range of 50 to 300 tons per hour with an average capacity of 150 tons per hour. Table B-2 shows the distribution of plant capacity in 1970.

The average plant employs four persons. The trend in recent years has been toward the construction of larger plants with a greater degree of automation.

B. Production

As Figure B-1 shows, the production of asphalt concrete has increased at an annual rate of 7 percent over the last ten years. Although growth has been cyclical, it is expected that this average growth rate will approximate 5 percent in the near future.

C. Capacity

Complete capacity data for the industry is not available. The average plant operates only 1500 hours a year at an average operating capacity of 50 percent. Inclement weather, inefficiencies in truck scheduling, time consumed in relocating portable plants, and the fact that the industry operates on a project basis are factors that contribute to the low operating ratio in this industry.

D. Consumption

Table B-3 outlines the consumption of asphalt concrete by market type over the last five years. With the interstate highway system nearing completion, the percentage of the total asphalt concrete consumed by this market has fallen off in recent years. It is expected,

TABLE B-1

INTEGRATION OF COMPANY ACTIVITIES - 1970[1]

ACTIVITY	PERCENT OF COMPANIES
Places (lays) asphalt concrete	86.0%
Contractor for road construction	84.0
Contractor for other construction	54.5
Own gravel pit or quarry	46.3
Produces Portland cement concrete	18.3
Distributes Liquid Asphalt	18.1

[1]Based on a sample of 387 of the 1846 companies operating in 1970 (Ref. 7)

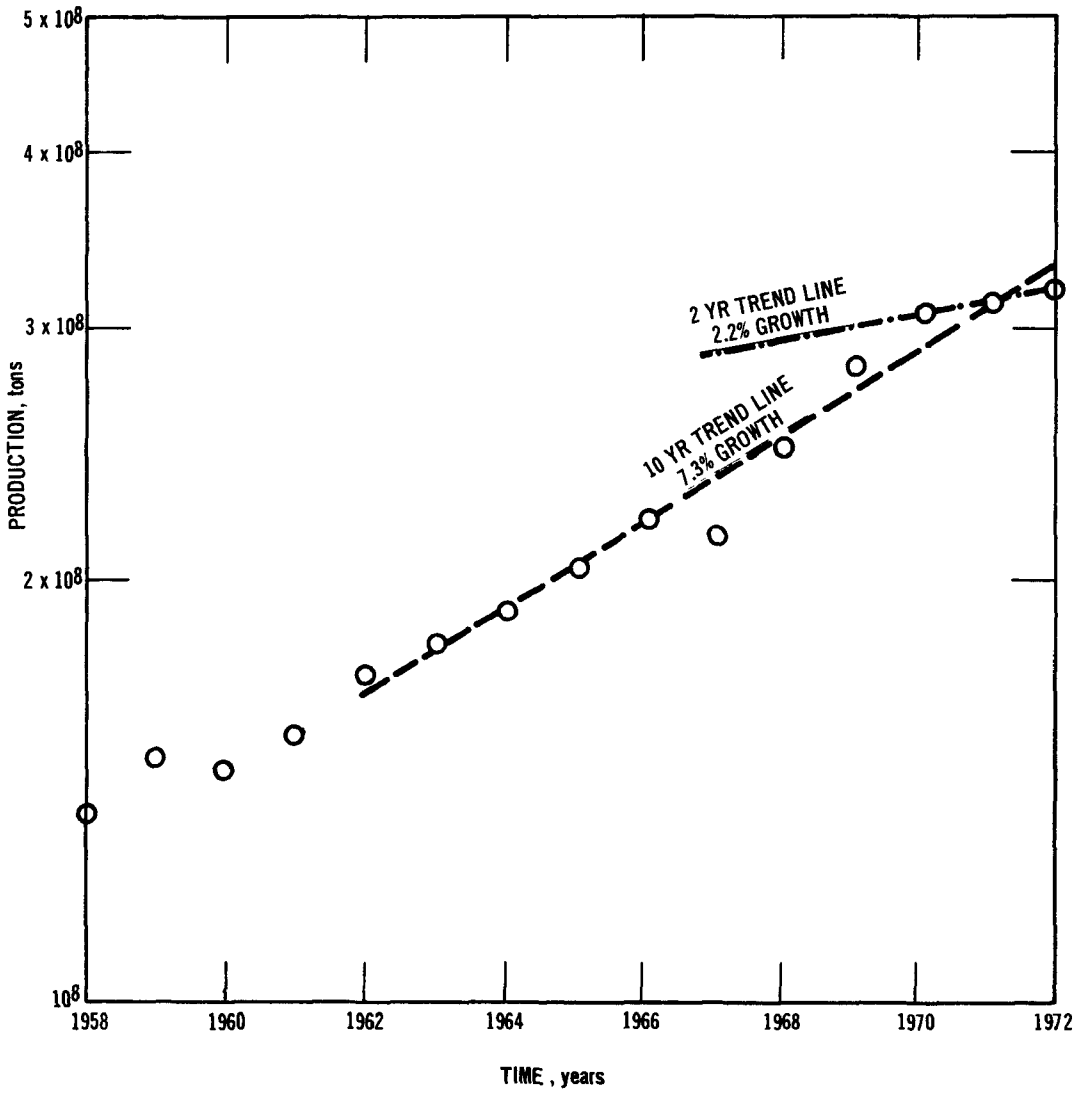

Figure B-1. Asphalt concrete production, 1958-1972 (source: NAPA).

TABLE B-2

DISTRIBUTION OF PLANT CAPACITY IN 1970[1]

CAPACITY (Tons/Hour)	PERCENT OF PLANTS
less than 120	15.5%
120-239	67.2
240-299	10.6
300 or greater	6.7
	100.0

[1]Based on a sample of 1025 of the 4450 plants operating in 1970 (Ref. 7).

TABLE B-3

CONSUMPTION OF ASPHALT CONCRETE BY MARKET TYPE

Market Type	1966	1967	1968	1969	1970
Interstate Highways	39.8	30.2	37.6	NA	40.4
State (other than Interstate)	77.4	73.5	85.3	NA	102.6
Municipal & County	42.0	49.7	52.7	NA	74.7
Airports	6.7	6.5	10.0	NA	12.4
Private & Commercial	39.8	49.7	60.2	NA	74.7
Other	15.4	6.5	5.0	NA	6.2
TOTAL	221.1	216.1	250.8	NA	311.0

CONSUMPTION OF ASPHALT CONCRETE BY CONSTRUCTION CATEGORY

Category	1966	1967	1968	1969	1970
New Construction	137.1	121.0	145.5	NA	158.6
Resurfacing	84.0	95.1	105.3	NA	152.4
TOTAL	221.1	216.1	250.8	NA	311.0

Source: Ref. 7

however, that the maintenance of the interstate system will keep the absolute consumption of asphalt concrete by this market at about its current level.

While the interstate consumption has leveled off, growth in other markets (especially municipal and country roads and private and commercial projects) has been very strong and this trend is expected to continue. The ratio of resurfacing work to new construction is another significant change in market-mix that has been occurring in recent years. As Table B-3 shows, resurfacing has grown from 38 percent of the market in 1966 to 49 percent in 1970 and this pattern is also expected to continue.

E. Prices

A recent ten state survey showed asphalt concrete prices at approximately $8/ton. However, there is wide variation on either side of this figure.

F. New Units

As previously mentioned, plants constructed recently have tended to be larger than older plants. Table B-4 shows the capacity distribution for a sample of new plants built since 1968. The average capacity of these plants is 240 tons per hour. By assuming a 5 percent growth rate and assuming that new plants will average 240 tons per hour in capacity at the historical operating ratio, it was estimated that about 90-100 new plants will be constructed each year over the next several years in order to meet the increased demand for asphalt concrete. In addition, the industry estimates that some 50 new plants will be built annually to replace obsolete plants. Thus, approximately 150 new plants each year would become subject to the proposed new source performance standard.

II. CONTROL COSTS

A. Introduction

A "model" plant approach has been used to evaluate the probable costs and economic impact that would occur as a result of the proposed standard. Capital investment requirements and operating statements have been approximated for plants representative of new installations

TABLE B-4

DISTRIBUTION OF CAPACITY FOR NEW PLANTS[2]

CAPACITY (Tons/Hour)	PERCENT OF PLANTS
less than 120	0
120-239	43.7
240-299	25.0
300 or greater	31.3
	100.0

[2]Based on a sample of 16 plants installed since 1968.

in the industry. Costs to meet various levels of air pollution control were then estimated to determine the economic impact. An effort was made to determine the difference in costs and impact for a new plant meeting the proposed standard over and above the costs and impact that would result from compliance with a typical state or local regulation.

B. Model Plants

Two model plants have been developed for cost and financial analysis. The characteristics assumed for these model plants are outlined in Table B-5.

C. Control Strategies and Costs

For each of the model plants defined above, costs were developed for three different air pollution control systems. Control Strategy 1 consists of a fabric filter and required auxiliary equipment capable of complying with the proposed standard. Control strategy 2 consists of a venturi scrubber and required auxiliary equipment (including water treatment) also designed to comply with the proposed standard. Control Strategy 3 consists of a multiple-centrifugal scrubber and required auxiliary equipment capable of complying with the process weight regulation guideline published in the Federal Register of August 14, 1971 (36 FR 15496). This regulation is less stringent than the proposed standard and is fairly representative of the type of state and local standards to which new plants are subject in the absence of the proposed standard.

The model plant control costs appear in Table B-6 and B-7. The derivation of these cost estimates is outlined below:

Control Strategy 1

The cost of purchasing and installing fabric filter control systems for the model plants were derived from a report prepared by the Industrial Gas Cleaning Institute.[5] The actual data appearing in that report are shown in Table B-8 along with the adjustments made to the raw data to make them applicable to the model plants being considered. First, the Industrial Gas Cleaning Institute (IGCI) estimates include the cost of cyclone separators. Since these devices are normally installed for economic reasons, that cost was deducted from the IGCI

TABLE B-5

MODEL PLANT CHARACTERISTICS

	Model A	Model B
Mixer Capacity	150 Tons/Hour	300 Tons/Hour
Plant Investment (without control equipment)[1]	$284,000	$354,000
Annual Hours of Operation	1500 Hours	1500 Hours
Average Operating Efficiency	50%	50%
Annual Production	112,500 Tons	225,000 Tons
Average Selling Price/Ton Product	$8.00/Ton	$8.00/Ton
Annual Sales	$900,009	$1,800,000
Gas Conditions at Cyclone Outlet[2]		
gas volume	25,000 ACFM	50,000 ACFM
temperature	350°F	350°F
particulate loading	1500 lb/hour	3000 lb/hour
particulate loading	7.0 gr/ACF	7.0 gr/ACF

[1]From Figure B-2.

[2]In each case, it was assumed that the fugitive dust sources (storage hoppers, elevators, vibrating screen, and weigh hopper) would be vented along with the exhaust from the rotary kiln dryer to a cyclone separator with an efficiency of 75 percent. The cost of this device is not included as air pollution control equipment since it is used to economically return material to the process. Gas volumes were derived from Figure B-3; temperature and particulate loadings were derived from data in reference 5.

TABLE B-6 - MODEL A

Mixer Capacity = 150 Tons/Hour
Annual Production = 112,500 Tons
Initial Investment = $284,000
Fabric Filter A/C Ratio = 6.5

	Control Strategy 1 Fabric Filters		Control Strategy 2	Control Strategy 3
	W/O Dust Rec	With Dust Rec	Venturi Scrubber	Multi-Centrifugal Scrubber
Inlet Conditions				
Gas Volume	25,000 ACFM	25,000 ACFM	25,000 ACFM	25,000 ACFM
Temperature	350°F	350°F	350°F	350°F
Particulate Loading	1500 lb/hr	1500 lb/hr	1500 lb/hr	1500 lb/hr
Particulate Loading	7.0 GR/ACF	7.0 GR/ACF	7.0 GR/ACF	7.0 GR/ACF
Outlet Conditions				
Gas Volume	24,700 ACFM	24,700 ACFM	20,500 ACFM	20,500 ACFM
Temperature	340°F	340°F	150°F	150°F
Particulate Loading	2.8 lb/hr	2.8 lb/hr	2.3 lb/hr	39 lb/hr
Particulate Loading	0.013 GR/ACF	0.013 GR/ACF	0.013 GR/ACF	0.22 GR/ACF
Efficiency	99.8	99.8	99.3	96.9
Equipment Cost[1]				
Device	38,600	38,600	11,200	9,300
Auxiliaries	9,000	18,700	16,500	12,100
Total Equipment	47,600	57,300	27,700	21,400
Installation	20,400	22,200	29,600	26,300
Total Installed Cost[1]	68,000	79,500	57,300	47,700
Annual Cost				
Labor	3,800	3,800	1,500	1,500
Materials	2,000	2,000	500	500
Utilities	2,500	2,600	5,900	3,100
Dust Disposal	2,800[2]	---	5,000[4]	5,000[4]
Recovered Material	---	(1,900)[3]	---	---
Depreciation	6,800	8,000	5,700	4,800
Interest & Property Taxes	6,800	8,000	5,700	4,800
Total Annual Cost	24,700	22,500	24,300	19,700
¢/Ton Product	22.0¢	20.0¢	21.6¢	17.5¢
Δ ¢/Ton Product	4.5¢	2.5¢	4.1¢	--
% Additional Investment	23.9%	28.0%	20.2%	16.8%
Δ % Over Strategy 3	6.1%	9.6%	2.9%	--

NOTES

[1] Adj. by CE Index (141.8/132.2) 1971 to April 1973 without primary cyclones.

[2] Dust disposal @ 2.5¢/ton product (NAPA via DOC).

[3] 561 tons/hr @ $3.40 (NAPA price, all recycled).

[4] Wet sludge disposal @ 4.5¢/ton product (NAPA via DOC).

TABLE B-7 - MODEL B

Mixer Capacity = 300 Tons/Hour
Annual Capacity = 225,000 Tons
Initial Investment = $354,000
Fabric Filter A/C Ratio = 6.5

	Control Strategy 1 Fabric Filters		Control Strategy 2	Control Strategy 3
	W/O Dust Rec	With Dust Rec	Venturi Scrubber	Multi-Centrifugal Scrubber
Inlet Conditions				
Gas Volume	50,000 ACFM	50,000 ACFM	50,000 ACFM	50,000 ACFM
Temperature	350°F	350°F	350°F	350°F
Particulate Loading	3000 lb/hr	3000 lb/hr	3000 lb/hr	3000 lb/hr
Particulate Loading	7.0 GR/ACF	7.0 GR/ACF	7.0 GR/ACF	7.0 GR/ACF
Outlet Conditions				
Gas Volume	48,200 ACFM	48,200 ACFM	41,000 ACFM	41,000 ACFM
Temperature	340°F	340°F	150°F	150°F
Particulate Loading	5.4 lb/hr	5.4 lb/hr	4.6 lb/hr	43 lb/hr
Particulate Loading	0.013 GR/ACF	0.013 GR/ACF	0.013 GR/ACF	0.12 GR/ACF
Efficiency	99.8	99.8	99.8	98.3
Equipment Cost[1]				
Device	57,900	57,900	19,200	14,500
Auxiliaries	11,600	21,700	29,300	20,700
Total Equipment	69,500	79,600	48,500	35,200
Installation	29,200	31,100	47,600	41,400
Total Installed Cost	98.700	110,700	96,100	76,600
Annual Cost				
Labor	5,000	5,000	3,000	3,000
Materials	4,000	4,000	800	800
Utilities	5,000	5,200	10,100	5,300
Dust Disposal	5,600[2]	---	10,100[4]	10,100[4]
Recovered Material	---	(3,800)[3]	---	---
Depreciation	9,900	11,100	9,600	7,700
Interest & Property Taxes	9,900	11,100	9,600	7,700
Total Annual Cost	39,400	32,600	43,200	34,600
¢/Ton Product	17.5¢	14.5¢	19.2¢	15.4¢
Δ ¢/Ton Product	2.1¢	(0.9¢)	3.8¢	--
% Additional Investment	27.9%	31.3%	27.1¢	21.6%
Δ % Over Strategy 3	5 1%	7.9%	4.5%	---

NOTES

[1]Adjusted from 1971 to April 1973 using CE Index (141.8/132.2).

[2]Dust disposal @ 2.5¢/ton product.

[3]1122 tons recovered/year at $3.40.

[4]1122 tons disposed of at 4.5¢/ton product.

estimates. Secondly, the IGCI estimated costs for portable equipment which they claim increases costs by about 10 percent over stationary equipment. Since the model plants under consideration are stationary, 10 percent was deducted from each cost element to discount the portability aspect. The adjusted costs were then plotted against gas volume (see Figure B-4) and installed costs of $68,000 for Model A and $98,700 for Model B were obtained from this plot.

These estimates were compared with actual expenditures for fabric filter control systems reported by asphalt batching plants. The data received from the plants was updated to 1973 dollars using Reference 1 and plotted against gas volume (see Figure B-5). As this plot shows, the costs estimated for the model plants agree quite closely with the data reported from actual installations.

Annual expenses for labor, materials, and electricity were estimated from data in the Handbook of Fabric Filter Technology[4]. The following cost factors were applied:

	Model A	Model B
labor	$.15/CFM-YR	$.10/CFM-YR
materials	.08/CFM-YR	.08/CFM-YR
utilities	.10/CFM-YR	.10/CFM-YR

It was assumed that all of the material collected by the fabric filter would be returned to the process as mineral filler. The value of this material was calculated as the product of the collection rate (1500 lbs/hr for Model A; 3000 lbs/hr for Model B), the annual hours of operation (1500 hours), the average operating efficiency (50 percent), and an assumed price for mineral filler ($3.40 per ton). The value of this material was treated as a credit against annual expenses.

Annual depreciation was taken to be straight-line over the expected life of the plant (10 years). Annual interest on the investment was assumed to be 8 percent and annual property taxes were assumed to be 2 percent of the initial investment.

These annual expenses and credits were summed and divided by the annual production to arrive at net control costs of $0.20 per ton of product for Model A and $0.15 per ton of product for Model B.

Control Strategies 2 and 3

Purchase and installation costs for the wet scrubbing systems were also obtained from the IGCI report[5]. The data appearing in that report are presented in Table B-9. This data was adjusted against gas volume, and the installed costs of wet scrubbing systems for the model plants are presented in Table B-10.

The capital costs of sludge ponds were estimated separately and added to the installed costs of the wet scrubbing system in Table B-10. It was assumed that the following storage capacities were required:

	Venturi Scrubber	Multi-Centrifugal Scrubber
Model A	20,000 gallons	5,000 gallons
Model B	45,000 gallons	11,000 gallons

The settling pond capital costs were estimated from two references[3,11] and it was assumed that one-half of this cost was for equipment purchase and one-half for installation.

Annual expenses for labor, materials, and utilities were estimated from data in Control Techniques for Particulate Air Pollutants[9]. The following cost factors were applied:

labor: $.06/CFM-YR

electricity: $.015/KWH

water: $.50/1000 Gallons

The power requirements assumed for the wet scrubbing systems (fans and pumps) are as follows:

	Venturi Scrubber	Multi-Centrifugal Scrubber
Model A	250 H.P.	150 H.P.
Model B	400 H.P.	250 H.P.

It was assumed that both plants would operate 1500 hours per year and that make-up water would amount to 10 percent of the recirculation rate (15 gallons/1000 CF for venturi scrubbers; 5 gal/1000 CF for multi-centrifugal scrubbers).

Periodic dredging of the settling pond and final disposal of the material collected by the scrubber is required when wet scrubbing systems are used. Industry sources state this cost runs about 4.5¢/ton of production.

Annual depreciation, interest, and property taxes were estimated under the same assumptions described for the fabric filter calculations.

The annual control costs per ton of product were calculated to be $.22 for Model A, Control Strategy 2; $.18 for Model A, Control Strategy 3; $.19 for Model B, Control Strategy 2; and $.15 for Model B, Control Strategy 3.

D. Discussion

Some conclusions may be drawn from the costs estimates appearing in Tables B-6 and B-7. Either the fabric filter or the venturi scrubber will enable a new plant to comply with the proposed standard and neither the capital costs nor the annualized costs for these devices appear to be signficantly different. Therefore, local conditions at the individual plant site will probably dictate the choice of control method.

The costs of a fabric filter system should be compared to the costs of a multiple-centrifugal scrubbing system (capable of achieving a typical state or local regulation) in order to measure the incremental costs that the proposed standard would impose upon a new plant. As Table B-6 shows, a fabric filter system for the smaller plant would necessitate 10 percent additional capital investment over a medium efficiency scrubber. On an annualized basis, however, the incremental cost amounts to only 3 cents per ton of product which is not significant.

The incremental investment required for the larger plant (Table B-7) is 8 percent and the annual costs are slightly less for the fabric filter than for the medium-efficiency scrubber. Capital and annualized costs apparently increase more rapidly for the scrubber than for the fabric filter as plant capacity is increased. This suggests that large

plants might find it economical to install fabric filters rather than scrubbers just to meet existing state and local regulations. Indeed, among the larger plants installed in recent years, the fabric filter has been by far the most common control system selected. It is important to note again that new plants are expected to be, on the average, much larger than the average existing plants and many of these would undoubtedly install fabric filter collectors even in the absence of the proposed standard.

III. ECONOMIC IMPACT

The economic impact can be measured by considering the incremental cost of meeting the proposed standard compared to the costs incurred in the absence of the proposed standard. Since EPA has promulgated ambient air quality standards for particulates, each state has established emission standards for this pollutant and any new plant must comply. Most state standards can be met by using a low-energy scrubber as detailed under Control Strategy 3 in Tables B-6 and B-7. The difference in cost between this strategy and Control Strategies 1 or 2 represents the incremental cost of control. Since many states have tighter regulations, the low-energy scrubber problem reflects the "worst case" situation.

On an annualized cost basis, it appears that the fabric filter is the lesser-cost device for both plant sizes. The key element is that the fabric filter collects the particulate material in a useful form while the material collected by the scrubber must be disposed of at the operator's expense. Thus, it may be assumed that most new plants would favor a fabric filter control system when selecting a control system to comply with the performance standard. This assumption is further substantiated by the trend of control equipment installed since 1968. Information was supplied by industry which showed that about 3 percent of the collectors installed in 1968 were fabric filters, while about 65 percent of the collectors installed in 1972 were fabric filters.

The installation of a fabric filter on the smaller plant necessitates an increase in capital investment of 28 percent over the base-plant investment. However, the incremental investment required to equip the plant with a fabric filter rather than a low-energy scrubber (to comply with most state standards) is about 10 percent. Similarly for the larger plant, the additional capital investment required by the fabric filter over the base-plant investment is 31 percent, while the incremental investment over equipping the plant with a low-energy scrubber is 8 percent.

It is not possible to say that, in all situations, the proposed standard will not create any additional financing problems. It is our judgment, though, that the incremental investment required by the proposed standard is in general not anticipated to create any serious additional financing problems for new asphalt concrete plants.

The Economics of Clean Air, 1972, concluded that asphalt concrete plants meeting state emission standards should be able to increase prices to cover the added cost of pollution control. Since the annual control cost for a new plant meeting the proposed standard closely approximates the cost for an existing plant meeting a typical state standard, our judgment was that a new plant would not be placed at a competitive disadvantage.

These judgments have been reinforced by the industry association's public comments that were submitted to EPA on July 24, 1973. On page 49 of their comments they stated:

> The National Asphalt Pavement Association, as it has indicated on many occasions to EPA, submits that the legitimate goal of protecting the environment and reducing emissions will be achieved by the imposition of a .06 standard rather than the .031 standard. It is submitted by the industry that this will result in an improvement of the emission levels by 99.8%, and is consistent with the goal which has been stated, of 99.7% by the Environmental Protection Agency. Further, it is submitted that the reduction is achievable at a reasonable cost without unduly endangering the existence of the industry or forcing the use of other alternative products. Thus, it is submitted that it is important that the standard be .06 and not .031.

> It is important that it be recognized that if the standard is .06, the equipment which will be required to be purchased will be either a venturi scrubber with a minimum 20-inch pressure drop or a baghouse with a 6-to-1 air-to-cloth ratio. It is submitted that there will be a significant improvement in the environment with an .06 standard. The .06 standard will further require that the plants be kept in good operating repair and condition or they will fail to meet the .06 standard. A .06 standard will avoid the problems of the size and shape of the particulates and also other problems which cannot be answered at the present time.

NAPA's conclusion is that the cost for a venturi scrubber with a 20-inch pressure drop or a baghouse with a 6-to-1 air-to-cloth ratio is reasonable. It is EPA's contention this equipment will achieve our proposed standard. Thus, NAPA's conclusion that cost for this type of equipment is reasonable reinforces our judgment that the cost to meet the proposed standard is reasonable.

TABLE B-8

ESTIMATED CAPITAL COSTS AND ADJUSTMENTS FOR FABRIC FILTERS
(Source: Ref. 5)

	Plant Size	
	30,600 ACFM	42,900 ACFM
Gas Cleaning Device Cost (IGCI Report)	$49,901	$61,160
Adjustment for cyclone	(4,800)	(6,600)
Adjustment for portability	(4,510)	(5,456)
Adjusted Gas Cleaning Device Cost	$40,591	$49,104
Auxiliaries Cost (IGCI report)	$10,046	$11,544
Adjustment for portability	(1,005)	(1,154)
Adjusted Auxiliaries Cost	$ 9,041	$10,390
Installation Cost (IGCI report)	$23,687	$28,485
Adjustment for portability	(2,369)	(2,849)
Adjusted Installation Cost	$21,318	$25,636
TOTAL COST	$70,950	$85,130
C.E. Plant Cost Index (141.8/132.2)	1.073	1.073
TOTAL ADJUSTED COST	$76,129	$91,344

TABLE B-9

ESTIMATES CAPITAL COSTS OF WET SCRUBBERS

(Source: Ref. 5)

	PLANT SIZE	
	30,600 ACFM	42,900 ACFM
Control Strategy 2		
Gas Cleaning Device Cost	$12,181	$15,930
Auxiliaries Cost	13,062	18,210
Installation Cost	27,360	33,571
Total Cost	$52,603	$67,711
CE Index (141.8/132.2)	x1.073	x1.073
(Scale Exponent is 0.75)	$56,443	$72,654
Control Strategy 3		
Gas Cleaning Device Cost	$ 9,975	$12,229
Auxiliaries Cost	11,013	14,539
Installation Cost	26,157	31,934
Total Cost	$47,145	$58,702
CE Index (141.8/132.2)	x1.073	x1.073
Total Adjusted Cost	$50,587	$62,987

(Scale Exponent is 0.65)

TABLE B-10

ESTIMATED CAPITAL COSTS OF WET SCRUBBERS

(ADJUSTED TO EPA MODEL PLANT SIZE)

	PLANT SIZE	
	25,000 ACFM	50,000 ACFM
Control Strategy 2		
Gas Cleaning Device Cost	$11,200	$19,200
Auxiliaries Cost	12,000	22,000
Installation Cost	25,200	40,400
Sludge Pond Cost Plus Inst.	8,900	14,500
Total	$57,300	$96,100
Control Strategy 3		
Gas Cleaning Device Cost	$ 9,300	$14,500
Auxiliaries Cost	10,100	17,500
Installation Cost	24,400	38,300
Sludge Pond Cost Plus Inst.	3,900	6,300
Total	47,700	76,600

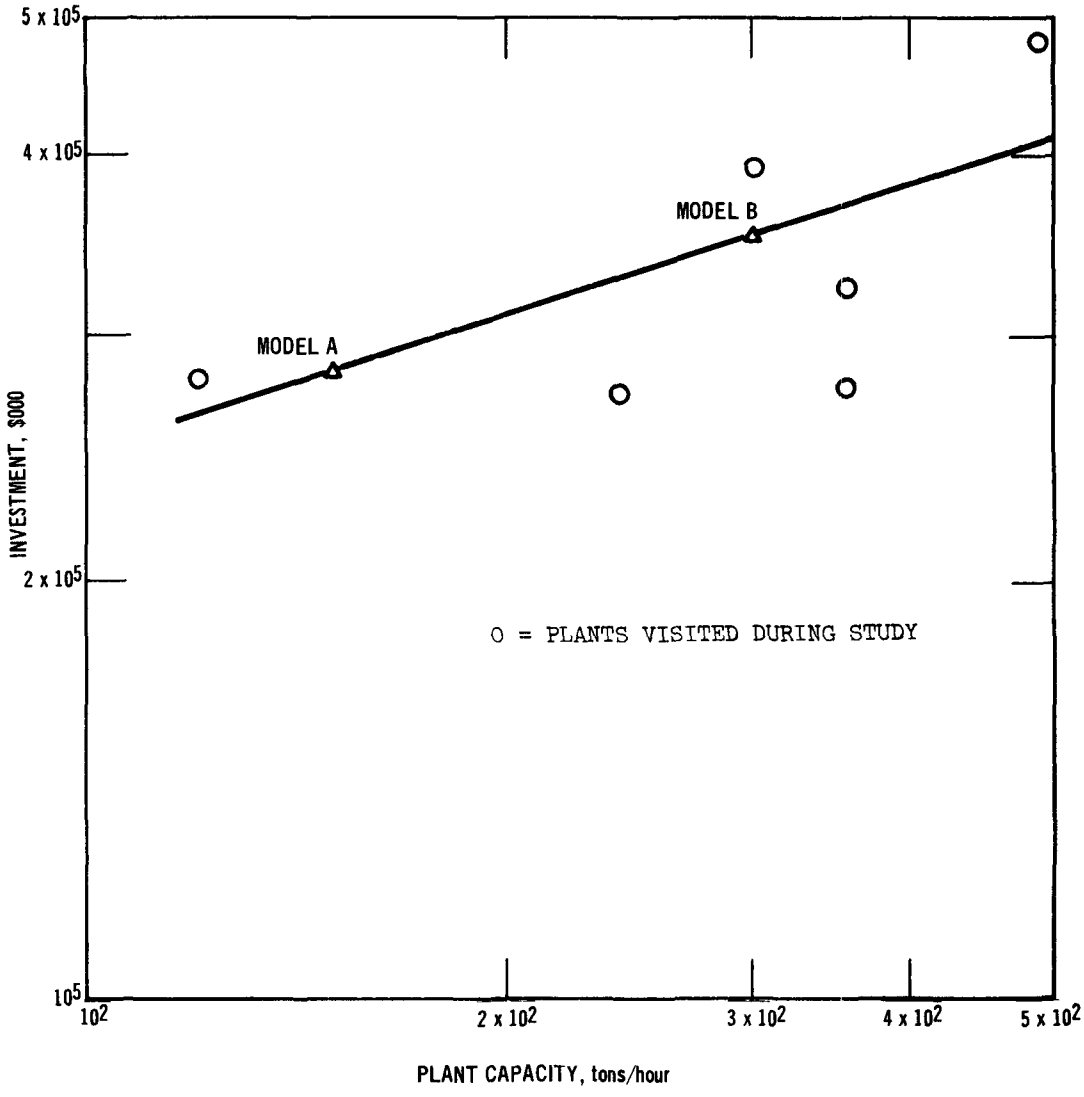

Figure B-2. Base plant investment versus plant capacity (adjusted to April 1973 dollars).

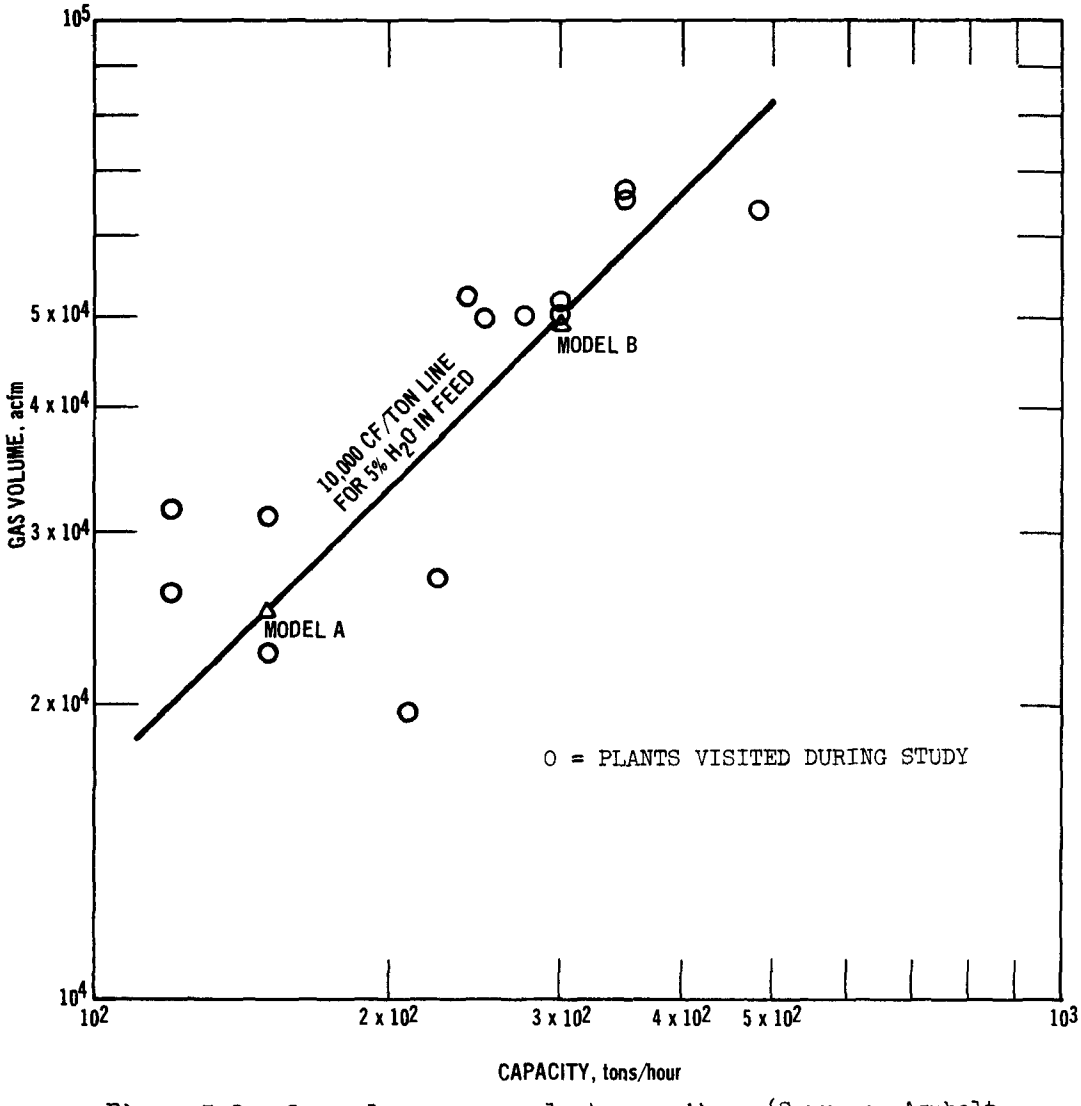

Figure 3-3. Gas volume versus plant capacity. (Source: Asphalt concrete plants visited during study.)

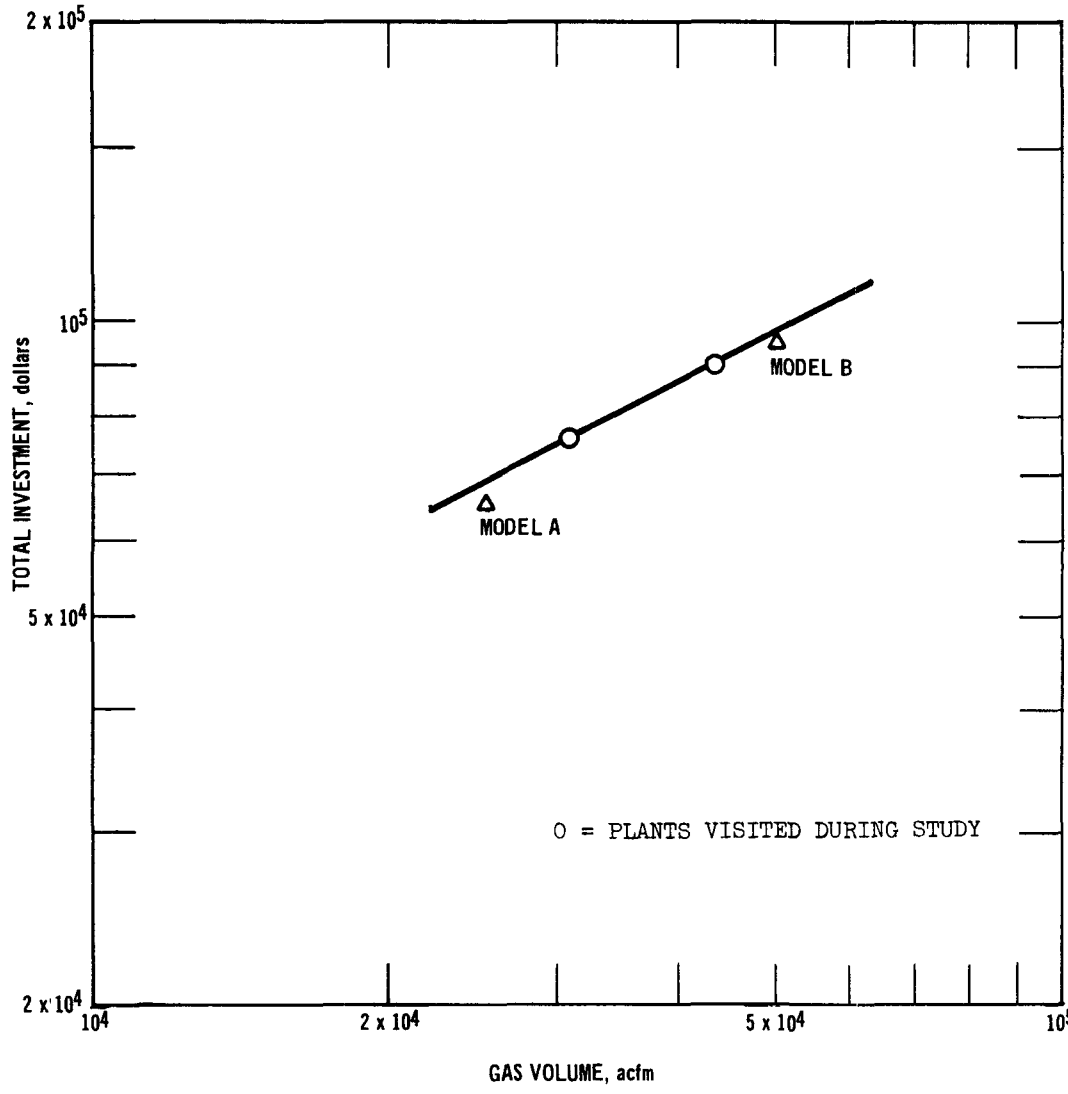

Figure B-4. Estimated capital costs of fabric filters versus gas volume. (Source: Adjusted data from IGCI report.)

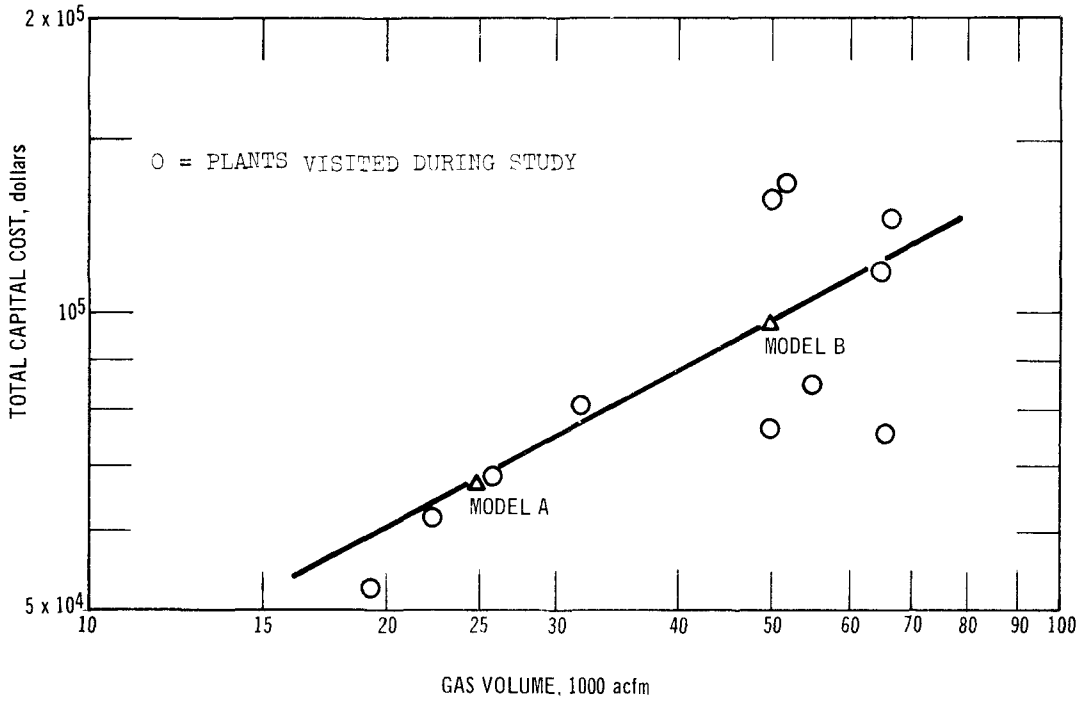

Figure B-5. Reported capital costs of fabric filters versus gas volume. (Source: Asphalt batching plants visited during study; costs adjusted to 1973 dollars by index in Ref. 1.)

REFERENCES

1. "Chemical Engineering", CE Plant Cost Index.

2. Environmental Engineering, "Background Information for the Establishment of National Standards of Performance for New Sources", 1971.

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5. Industrial Gas Cleaning Institute, Air Pollution Control Technology and Costs in Nine Selected Areas, Special Interim Report, 1971.

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8. National Asphalt Paving Association, private communication.

9. National Air Pollution Control Administration, Control Techniques for Particulate Air Pollutants, 1969.

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11. Popper, Herbert, Ed. Modern Cost-Engineering Techniques, 1970, McGraw-Hill.

APPENDIX C. THE ECONOMIC IMPACT OF NEW SOURCE PERFORMANCE STANDARDS UPON PETROLEUM REFINERIES

I. INTRODUCTION

The proposed new source performance standards pertaining to both petroleum refinery fluid catalytic cracking units and the burning of gaseous refinery fuels generate control costs that are higher on a per-barrel basis for the smaller refineries than for the larger refineries. This disparity in per-barrel control costs raises the question of the degree of economic impact upon the smaller refiners relative to the larger refiners. The complexity of the situation is compounded by the fact that new and modified refineries will also be subject to costs for controlling water pollution and costs to remove lead from gasoline as well as the costs for controlling air pollutants. These environmental cost pressures, coupled with potential domestic shortages of petroleum products, necessitated a study of the economic impact of projected pollution abatement requirements upon the domestic petroleum refining industry, with particular emphasis being given to the small refiner. It should be noted that normal economies of scale in the refining industry appear to preclude any new small refineries. Modifications, however, to existing small refineries are always a possibility. Since control costs for new large refineries do not appear to be large enough to adversely impact upon construction of new large refineries, this analysis should mainly be interpreted in light of the effects of the proposed new source performance standards upon modified small refineries.

II. CONTROL COSTS - NEW SOURCE PERFORMANCE STANDARDS ONLY

Annualized control costs, on a per-barrel basis, for compliance with the proposed new source performance standards will vary inversely with refinery size. This is due to the fact that total control costs for control of the fluid catalytic cracking unit and the refinery fuel gas hydrogen sulfide emissions do not decrease as rapidly as the decrease in refinery size. Table C-1 illustrates this situation.

TABLE C-1. PETROLEUM REFINERY CONTROL COSTS

(New Source Performance Standards Only)

	Capital Costs			Annualized Costs			
Refinery Size	Fuel Gas	Cat. Cracker	Total	Fuel Gas	Cat. Cracker	Total	
5,000 BCD	$560M	0*	$560M	$185M	0*	$185M	10¢/bbl
10,000	590	350	940	200	67	267	7¢
50,000	900	785	1685	365	147	512	3¢
100,000	1200	1150	2350	530	213	743	2¢

*Refinery too small to have a catalytic cracking unit.

The basic assumptions underlying Table C-1 are as follows:

1. Capital costs represent installed equipment.

2. Annualized costs include operating and maintenance costs plus capital charges at 15.7 percent of capital.

3. The fuel gas control system consists of an amine treating unit and a 3-stage Claus sulfur plant.

4. The catalytic cracker control system consists of an electrostatic precipitator. The precipitator is designed for 300 square feet of collection plate area per thousand actual cubic feet of gas per minute.

5. The catalytic cracking unit is sized at 30 percent of the total refinery size.

6. Annualized costs do not include any credits for recovered material.

7. The sulfur content of the crude oil being processed is 0.5 percent.

8. The percentage of sulfur in the crude oil that reverts to the fuel gas is 45 percent.

Table C-1 shows that annualized control costs for a 5,000 barrel per calendar day (BCD) refinery amount to 10¢ per barrel of finished product whereas the annualized control costs for a 100,000 BCD refinery are 2¢ per barrel of finished product. The smaller refiner, therefore, is experiencing an 8¢/bbl cost penalty relative to the larger refiner.

It should be noted that Table C-1 does not take into account those production situations in which a refiner would remove the hydrogen sulfide from the fuel gas even in the absence of emission control regulations. In cases like this the cost of hydrogen sulfide removal would not be considered an emission control cost and the impact of the regulations upon the refiner would be decreased considerably.

III. CONTROL COSTS - TOTAL CONTROL REQUIREMENTS

The costs for control of air pollutant emissions from new source petroleum refineries are not the only environmental costs being incurred in the petroleum industry. In addition, the domestic refining industry is facing costs for control of water pollution and costs for removing lead from gasoline. These costs will also tend to impact more severely upon the small refiner than the larger refiner. Table C-2 presents an estimate of the per-barrel annualized costs for control of air and water emissions and for removing lead from gasoline.

TABLE C-2. ANNUALIZED CONTROL COSTS

(Total Environmental Requirements)

Refinery Size	Air	Water	Lead	Total
5,000 BCD	10¢/bbl	17	12	39¢/bbl
10,000	7	8	6	21
50,000	3	4	2	9
100,000	2	3	2	7

It should be noted from Table C-2 that total control costs for air emission reductions, water pollution abatement, and lead removal costs again are greatest for smaller refiners. Total control costs for an average 5,000 BCD refiner at 39¢/bbl are 32¢/bbl higher than the control costs being faced by the average 100,000 BCD refiner.

The above summary of water pollution control costs and the costs of removing lead from gasoline are based on the following assumptions:

1. Water pollution control costs represent a preliminary EPA estimate of costs incurred through the use of best practicable technology in existing plants by 1977. Costs for new source compliance with the effluent guidelines will generally be less than the cost of compliance in existing plants since new sources will generally be designed in such a fashion that water treatment costs are minimized. Therefore, the costs for control of water pollution shown in Table C-2 above approximate a maximum estimate of the costs to be incurred in a new facility. The use of best available control technology by 1983 is expected to increase the costs for existing plants. For example, a 25,000 BCD refinery that would incur best practicable control costs of 5¢/bbl would incur best available control costs of 12.5¢/bbl. An important point to note with regard to the above water pollution control costs is that the costs apply to the treatment of an average water flow for a given size refinery. Plants with water usage rates in excess of the average amount assumed in the table above will incur costs higher than the costs assumed above. In some cases these additional treatment costs can be substantial. The extreme variability among existing petroleum refineries makes analysis of this point quite difficult.

2. Lead removal costs based upon an estimate of refining costs prepared by Bonner and Moore of approximately 3.6 cents per barrel of gasoline for large refiners and 12.0-24.6 cents per barrel for smaller refiners. It should be noted that the above costs assume that modern processing facilities are available at the refinery. If this is not the case, then total costs for refining and distribution costs could increase by an additional 55 cents per barrel of gasoline.

3. Lead removal costs based upon conversion of 50 percent of the crude oil input to gasoline. Higher conversion factors would increase the cost impact of the lead removal regulation whereas lower conversions would lessen the overall economic burden.

IV. ECONOMIC IMPACT - TOTAL CONTROL REQUIREMENTS

The profit margins of small domestic refiners are believed to vary widely due to numerous factors such as location relative to both crude supplies and finished product markets, individual operating economies, and specialized markets. A gross estimate of average small refiner profitability is approximately 1/2¢ per gallon of product, or 21¢ per barrel. Comparing this level of profitability to the total control costs shown in the preceding table it is seen that a 5,000 BCD refinery will be placed in a position of losing 18¢/bbl and a 10,000 BCD refinery will break even after complying with the new source performance standards for air pollutant emissions, the water pollution guidelines, and the lead removal regulations. Even though a refiner with a capacity of 50,000 BCD would not be placed in a loss position due to pollution control requirements, the refinery profit margin would be cut by approximately 40 percent by the total environmental cost of 9¢/bbl. The 50,000 BCD refiner, however, is probably large enough to experience profits somewhat in excess of 21¢/bbl so that his profit after controls may be in excess of 12¢/bbl. It is apparent, therefore, that the major impact of the current environmental requirements upon the domestic petroleum refining industry will fall upon refiners that have capacities of 50,000 BCD and less.

It appears, however, that future profitability for the domestic refining industry will increase to the point where even average small refiners will not be in a loss position after compliance with environmental regulations. The mechanism that will allow this situation to occur is the Import License Fee System. This fee system, which was initiated by Presidential Proclamation 4210 (Federal Register, Vol. 38, No. 75, Thursday, April 19, 1973) is essentially a tariff system that will apply to both imported crude oil and imported finished products. The fees to be paid on imported materials will increase over time, starting in 1973 and reaching a maximum level in 1975. The fee schedule is shown in Table C-3.

TABLE C-3. FEE SCHEDULE (¢/bbl)

Product	May 1 1973	Nov. 1 1973	May 1 1974	Nov. 1 1974	May 1 1975	Nov. 1 1975
Crude	10-1/2	13	15-1/2	18	21	21
Motor Gasoline	52	54-1/2	57	59-1/2	63	63
All Other Finished Products and Unfinished Oils[1/]	15	20	30	42	52	63

[1/] Except ethane, propane, butanes, and asphalt.

The purpose of the fee system, as quoted in the Federal Register referred to above, is "to discourage the importation into the United States of petroleum and petroleum products in such quantities or under such circumstances as to threaten to impair the national security; to create conditions favorable, in the long range, to domestic production needed for projected national security requirements; to increase the capacity of domestic refineries and petrochemical plants to meet such requirements; and to encourage investment, exploration, and development necessary to assure such growth." Encouragement of domestic production was deemed necessary due to the increasing trend in this country to import petroleum products. A projection of domestic supply and demand that was prepared prior to the announcement of the Import License Fee System by the National Petroleum Council is presented in Table C-4.

TABLE C-4. U.S. PETROLEUM SUPPLY AND DEMAND

(Thousands of Barrels/Day)

	1973	1975	1980	1985
Total U.S. Product Demand	17,600	19,800	22,500	26,200
Product Output[1/]	12,725	13,257	15,115	16,820
Excess Demand	4,875	6,543	7,435	9,380
% of Total Demand	28%	33%	33%	36%

[1/] Output at 96-97% of total domestic refinery capacity.

It is believed that the Import License Fee System will spur domestic refinery construction but that the United States will still be a net importer of petroleum products at least through 1985. The impact of the fee system on domestic prices will be to increase finished product prices by 63¢/bbl in 1975, assuming that price controls are no longer in effect at that time. The reasoning behind this conclusion is based upon the shortage of domestic refining capacity that is projected to exist through 1985. A producer who imports finished products would be expected to raise his prices to cover the import fee. Since all refiners are operating essentially at capacity there is no incentive for a competing refiner to keep his prices low relative to the producer that imports petroleum products since he will not generate any additional sales by doing so. This means that domestic prices will rise by an amount equal to the import fee, or 63¢/bbl. Note that this mechanism will occur only in the case where domestic refineries are being utilized essentially at capacity.

The same type of mechanism may also occur in the area of crude supplies, with crude prices rising by the amount of the import fee, or 21¢/bbl. This means that domestic refining profits would increase by a net amount of 42¢/bbl. It is altogether possible, however, that domestic crude prices, particularly for the smaller, inland refiners who are in close proximity to adequate crude supplies, will not be increased by 21¢/bbl. This means that profit margins could increase by the full amount of the general finished product price increase, or 63¢/bbl. In general, then, the Import License Fee System will generate additional profits, over and above current levels, of 42-63¢/bbl for the domestic petroleum refining industry.

The additional profits generated by the Import License Fee System will allow average small refiners to comply with all environmental regulations and still have an incentive to expand their operations. The differences in control costs for the small average refiner relative to the large refiner will still exist, but with the fee system in operation the average small refiner will not be forced into a no-growth situation because of compliance with environmental regulations.

The above mechanism resulting in an industry-wide price increase of 63¢/bbl would not occur in a situation constrained by price controls as they are currently being implemented. This is due to the fact that only cost increases are allowed to be passed on as price increases and no windfall profits can be generated. Prices would increase, but not by the full margin of 63¢/bbl for all producers. Pollution control costs would be passed on in the form of price increases also, but again only on a dollar-for-dollar basis. This would mean that small refiners would be at a distinct price disadvantage relative to large refiners. Whereas in the short run the small refiner might be able to sell his output since overall industry refining capacity is constrained, there are long term problems with this type of system. Therefore, this analysis is dependent upon the assumption that price controls will be essentially removed from the domestic petroleum refining industry by 1975 so that the import fee system, or a similiar system, would generate industry-wide price increases sufficient to ensure the viability of small refiners.

As mentioned previously, those existing plants with water usage rates considerably in excess of average refinery usage rates could incur water treatment costs much greater than the industry average costs. It appears possible that these costs, in addition to costs for lead removal for gasoline and compliance with state air quality regulations, could cause the closing of some small refineries. These closings, of course, would occur in the absence of any new source performance standards.

There is a situation whereby the proposed new source performance standards could adversely impact upon modified existing refineries. This situation could possibly occur as a result of a refiner being forced to add another process unit to produce an unleaded grade of gasoline. If the process

unit burned refinery fuel gas it would be subject to the proposed new source performance standards and their attendant costs. These costs could be large enough to make the modification uneconomic. If additional output was obtained as a result of the modification, however, this output could be sold at a net premium of 42-63¢/bbl under the situation created by the Import License Fee System. Since compliance costs resulting from the new source performance standards are less than this amount there appears to be no barrier to refinery modifications due to the proposed new source performance standards, even for small refiners, as long as additional output is obtained.

Returning to the situation where no additional output is obtained, it is still highly possible that there would be enough flexibility in the refinery fuel supplies so that a fuel other than refinery fuel gas could be burned in the new process unit. In this situation the new source performance standard would not apply and no adverse economic impact would be experienced by the refiner. It seems that this situation could easily be the case for those refineries that modify their facilities in order to produce unleaded gasoline.

APPENDIX D. LIST OF COMMENTATORS

Comment number	Commentator	Affiliation
1	Rosenstern	Koppers Co., Inc.
2	Deemer	McCarter Corp.
3	Spaeth	Bulk Terminals Co.
4	Gillilland	Ideal Cement Co.
5	Sheehan	American Lung Association
6	Not a comment (determined after numbering)	
7	Wainer	Wainer Brothers, Inc.
8	Soares	White's Mines, Inc.
9	Feldman	Lake-River Terminals
10	Moore	Moore Brothers Construction
11	Todd	Percy Todd Mfg., Co.
12	Holland	Holland Construction
13	Fleischman	County Asphalt Co.
14	Plummer	E.D. Plummer Sons
15	Nespeco	National Oil Fuel Inst.
16	Simmons	Flatiron Paving
17	Simmons	Eastern Industries
18	Madison	Lehman-Roberts Co.
19	Bury	Midwest Asphalt Corp.
20	Vanderlinden	Midstate Contractors, Inc.
21	Moore	Associated General Contractors
22	Schofield	Gen. Am. Transportation Corp.
23	Hilton	Gulf Asphalt Corp.
24	Kelley	MacDougald-Warren, Inc.
25	Phillip	Songamo Construction
26	Wales	Henley-Lundgren Co.
27	Broce	Broce Construction Co.
28	Anthony	Washita Construction Co.
29	Busch	Ready Mix Sand & Gravel
30	Yocum	Hinkle Contracting
31	Valentine	Peter Kiewit Sons Co.
32	Smith	Pike Industries
33	Kirkby	S.E. Johnson Co.
34	Dickinson	Rust Engineering Co.
35	Johnson	Rohm and Haas Co.

APPENDIX D. LIST OF COMMENTATORS (continued)

Comment number	Commentator	Affiliation
36	Strain	Strain Brothers, Inc.
37	Donovan	M.F. Roach Co.
38	Hamn	Texas Asphalt Pavement Assn.
39	Fry	Miami Asphalt Corp.
40	Babler	Babler Bros., Inc.
41	MacRitchie	A.S. Langenderfer
42	Stricklin	Hadley Construction Co.
43	Chleboski	Allegheny County Health Dept.
44	Heldenfels	Heldenfels Bros.
45	Brooks	Brooks Construction Co.
46	Berry	L.A. Reynolds, Co.
47	Docter	Maclair Asphalt Co.
48	Lemon	Lemon Construction Co.
49	Kersey	Derby Refining Co.
50	Teglia	Paving Mix & Construction Co.
51	Masters	Industrial Asphalt
52	Snyder	Buffalo Slag Co.
53	Azzarelli	Azzarelli Construction Co.
54	Brooks	Brooks and McConnell
55	Richardson	Macasphalt Corp.
56	Not a comment (determined after numbering)	
57	Kowalik	Gulf Oil Co.
58	Duininck	Duininck Bros. & Gilchrist
59	Gibb	Interstate Amiesite Corp.
60	Masters	Industrial Asphalt
61	Decker	Rein, Schultz, & Dahl
62	Levine	Alabama Dept. of Public Health
63	Smith	Entropy Environmentalists, Inc.
64	Carter	Carter Co., Inc.
65	Mathis	Mago Construction Co.
66	Martinez-Lazaro	Puerto Rico Asphalt Co.
67	Acquaviva	O'Keefe Asphalt Products
68	Darnell	Washington Asphalt Co.
69	Vosti	Reed and Graham, Inc.
70	Skogsberg	North American Car Corp.
71	Chavez	Assn. de Pavimentos Asfalticos
72	Schultz	Sherwin Corp.
73	Rath	Rason Asphalt, Inc.

APPENDIX D. LIST OF COMMENTATORS (continued)

Comment number	Commentator	Affiliation
74	Echstenkamper	Plant Mix Asphalt Industry
75	Childress	Quapaw Company
76	Fehsenfeld	Crystal Flash Petroleum
77	O'Sullivan	N.Y. Bituminous Concrete Producer
78	Eaton	Dixie Asphalt Co.
79	Dickson	Lige Dickson Co.
80	Ashmore	Ashmore Mfg., Co.
81	Chavez	Betteroads Asphalt Corp.
82	Yarbrough	University Asphalt Co.
83	Phelan	California Asphalt Pavement Assn.
84	Frampton	Empire Construction, Inc.
85	Waller	Cornell Construction Co.
86	Knott	Johnson County Asphalt, Inc.
87	McCarthy	McCarthy Improvement Co.
88	Chadbourne	E.M. Chadbourne, Inc.
89	Eccles	Gibbons & Reed Co.
90	Mims	J.F. Cleckley & Co.
91	Clark	Manufacturing Chemists Assn.
92	Bennett	Rissler & McMurry
93	Kuhn	Columbus Bituminous Concrete Corp.
94	Huelsen	American Foundrymen's Society
95	Buschman	Texas Mid-Continent Oil & Gas Assn.
96	Sloan	Sloan Construction Co.
97	Vickers	Florida Asphalt Paving Co.
98	Weers	Westinghouse Electric Corp.
99	Robins	Georgia Office of Planning and Budget
100	Smith, Reed	Jimar Paving Co.
101	Barcklay	Washington State Assn. of County Engrs.
102	Farrell	Fitzgerald Bros. Construction Co.
103	Brower	Brower Construction Co.
104	O'Kane	Stahl Construction Co.
105	Kowalik	Gulf Oil Co.
106	Minor	Asphalt Paving Assn. of Washington
107	Bartus	Bar-Coat Blacktop Co.
108	Moore	Texas Eastern Transmission Corp.
109	Keller	Oklahoma Asphalt Pavement Assn.

APPENDIX D. LIST OF COMMENTATORS (continued)

Comment number	Commentator	Affiliation
110	Crim	Crim Engineering (later revised; see 206)
111	Pond	Asphalt Products Corp.
112	Keating	P.J. Keating Co.
113	Lunche	Los Angeles County APCD
114	Anony.	Conn. Bituminous Concrete Producers
115	Fitzgerald	Georgia Asphalt Pavement Assn.
116	Ruffer	Alabama Asphalt Pavement Assn.
117	Huddleston	Oregon Asphalt Pavement Assn.
118	Bowen	Mississippi Asphalt Pavement Assn.
119	Anony.	Michigan Asphalt Pavement Assn.
120	Lance	Asphalt Contractors Assn. of Fla. Inc.
121	Fulton	Flexible Pavements Inc.
122	Yeargain	Louisiana Asphalt Pavement Assn.
123	Boles	Tennessee Asphalt Pavement Assn.
124	Thelen	Wisconsin Asphalt Pavement Assn.
125	Rihm	N.Y. State Dept. of Environmental Conservation
126	Arps	Tri County Asphalt Corp.
127	Ross	Carolina Asphalt Pavement Assn.
128	Smith, Robert L.	Warren Bros. Co.
129	Maudlin	Brass & Bronze Ingot Institute
130	Derr	Wendel Kent & Co., Inc.
131	Best	A.I.Ch.E., So. Texas Section
132	Appleby	Dover Equip. & Machine Co.
133	Cromwell	HEW, NIH
134	Haddock	Crowell Constructors, Inc.
135	Cellini	Ill. Asphalt Pavement Assn.
136	Cellini	Ill. Asphalt Pavement Assn.
137	Keller	Ok. Asphalt Pavement Assn.
138	Denton	Warren Bros. Co.
139	Brenholts	Hercules Inc.
140	Hoene	Minn. Asphalt Pavement Assn.
141	Swenson	Crown Central Petroleum Corp.
142	Silverman	Salt River Project
143	Mills	Exxon Co.
144	Moore	Road Builders Inc. of Tenn.
145	Virgalitte	The Standard Slag Co.

APPENDIX D. LIST OF COMMENTATORS (continued)

Comment number	Commentator	Affiliation
146	Heath	Precipitation Assn. of Am., Inc.
147	Michels	Eaton Asphalt Paving Co.
148	Chapman	Beckman Instruments, Inc.
149	Maloney	Fed. Highway Assn., Dept. of Transportation
150	Ferreri	Md., Envirn. Health Administration
151	Funk	Cold River Hot Mix Corp.
152	Funk	Vermont Paving Corp.
153	Sprinkel	Vernon Asphalt Material Corp.
154	Babson	So. Carolina Asphalt Pavement Assn.
155	Kramer	Fay, Spofford & Thorndike Inc.
156	Gray	National Asphalt Pavement Assn.
157	Eidemiller	Adam Eidemiller
158	Brook	Wellsboro Asphalt Co.
159	Anony.	Burlington Asphalt Corp.
160	Anony.	Precipitation Assn. of Am., Inc.
161	Anony.	Mix Design Methods, Inc.
162	Banks	Banks Construction Co.
163	Hallman	UOP Process Division
164	Harrison	Western Oil and Gas Assn.
165	Hanagan	New Mexico Oil & Gas Assn.
166	Scott	Union Oil Co. of Calif.
167	Doyle	Peter Kiewit Sons' Co.
168	Mullins	Mullins Bros. Paving Contrs., Inc.
169	Smith & Brock	Astec Industries, Inc.
170	Proctor	Rea Construction Co.
171	Mathews	Couch Construction Co.
172	Whalen	Asphalt Materials & Paving Co., Inc.
173	Perkins	N. Mexico Envirn. Improvement Agency
174	Ballard	Phillips Petroleum Co.
175	Bury	Bury & Carlson, Inc.
176	Coppoc	Texaco, Inc.
177	Bell	JoB Construction Co.
178	Sebastian	Envirotech Corp.
179	Showers	Arizona Rock Products Assn.
180	Talbert	Agway, Inc.
181	Haxby	Shell Oil Co.
182	Ambrosius	Mid-Continent Oil & Gas Assn., Ark.-La. Div.

APPENDIX D. LIST OF COMMENTATORS (continued)

Comment number	Commentator	Affiliation
183	Massey	Delaware Asphalt Pavement Assn.
184	Gammelgard	Am. Petroleum Institute
185	Reeves	Reeves Construction Co.
186	Leo	Ward Pavements, Inc.
187	Dick	Trumbell Corp.
188	Keller	Bergan Asphalt Corp.
189	Oddinger	South State Inc.
190	Parker	Pan Am. Construction Co.
191	Mayes	Am. Petrofina Co of Texas
192	Goder	Joseph Goder Incinerators
193	Plaks	EPA, Metallurgical Processes Section
194	Bumford	N.H. Air Pollution Control Comm.
195	Edwards	Collier, Shannon, Rill and Edwards
196	Lindstrom	Ala. Dept. of Public Health
197	Sterling	Wayne Co. Dept. of Health, Mich.
198	Hayes	National Asphalt Pavement Assn.
199	Bulley	Wash. State Highway Comm., Dept. of Highways
200	Gartrell	TVA, Dir. Envirn. Planning
201	Valentinetti	Vermont, Agency of Environ. Conservation
202	McCullough	Mt. Hope Materials Corp.
203	Shepard	Shepard Construction Co., Inc.
204	Weston	Roy F. Weston, Inc.
205	Reynolds	Atlantic Richfield Co.
206	Crim	Crim Engineering
207	Barden	Texas Air Control Board
208	Palmer	Construction Industry Manu. Assn.
209	Hampton	Rocky Mtn. Oil and Gas Assn.
210	Williams	Mid-Continent Oil & Gas Assn., Miss.-Ala. Div
211	Crosby	Ward Pavements Inc.
212	Anderson	Bethlehem Steel Corp.
213	Christy	N.J. Asphalt Pavement Assn.
214	Hale	unknown
215	Hagerman	unknown
216	Schwellenbach	unknown
217	Christy	unknown
218	Eidemiller	Adam Eidemiller, Inc.

APPENDIX D. LIST OF COMMENTATORS (continued)

Comment number	Commentator	Affiliation
219	Rost	Burkholder Pavement Inc.
220	Brewer	The Brewer Co. of Fla., Inc.
221	Graves	Pennzoil
222	Anony.	National Bituminous Inc.
223	Anony.	Allegheny Contracting Industries, Inc.
224	Anony.	Gallow Asphalt Co.
225	Bartholomew	Burrell Construction and Supply Co.
226	Barrett	Arawak Paving Co. Inc.
227	Babson	So. Carolina Asphalt Pavement Assn.
228	Kukish	Edison Asphalt Co.
229	Sachse	Granite Material Corp.
230	Gilliam	Scott Industries, Inc.
231	Brugman	U.S. Oil & Refining Co.
232	Clarke	Rohm & Haas Co.
233	Nelson	E.D. Etnyre & Co.
234	Kshatriya	Aqua Systems Corp.
235	Castro	Ponce Asphalt, Inc.
236	Tantzen	Graver Tank & Mfg. Co.
237	Robinson	Mallinckrodt Chemical Works
238	LaFave	Chicago Bridge & Iron Co.
239	Ladd	Getty Oil Co.
240	Gray, J. Earle	Getty Oil Co.
241	Fleischhauer	Gietz-Melahn Asphalt Co.
242	Montgomery	U.S. Congress (Miss.)
243	Smith, Robert L.	Warren Bros. Co. (addendum to 128)
244	Esola	Union Paving Co.
245	Ruth	East Kentucky Paving Co.
246	Cady	Allied Chemical Corp.
247	Hovey	N.Y. Division of Air Resources
248	Hamo	Golden Eagle Construction Co.
249	Bumford	N.H. Air Pollution Control Comm.
250	Cramer	Standard Oil of Calif.
251	Tenney	Buell Envirotech
252	Jones, Robert	Donohue & Assoc., Inc.
253	Reynolds	Atlantic Richfield Co.
254	Storlazzi	EPA, Region I
255	Smith	Entropy Environmentalists, Inc.

APPENDIX E. SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
		Subpart I. Asphalt Concrete Plants	
I-1	7, 13, 21, 31, 41, 44, 47, 54, 57, 67, 69, 73, 74, 80, 82, 84, 86, 87, 96, 109, 117, 127, 147, 153, 156, 172 186, 211, 245	The asphalt industry is not a "significant contributor" to air pollution in the United States that endangers or may tend to endanger public health or welfare.	The Clean Air Act, as amended, directs the Administrator to promulgate new source performance standards for sources which he determines may contribute significantly to air pollution, but it does not provide him with specific criteria or guidelines to determine what is significant. Therefore, to make such a determination, the Administrator must rely upon judgement. In the case of particulate matter - a pollutant for which national ambient air quality standards have been promulgated - the Administrator considers all sources to contribute to the endangerment of public health or welfare. The presence of particulate matter in the air is the result of numerous diverse mobile and/or stationary sources. Because ambient concentrations of particulate matter depend upon a number of factors such as distribution of sources, topography, height of which the pollutant is emitted, and meteorological conditions, a source may be considered significant in one location and not in another. This makes it meaningless to develop a firm definition of "significant source" that could be applied nationwide. The Act provides the Administator of EPA a variety of regulatory authorities which may be used singly or in combination to achieve the purposes of the Act. For particulate matter, the Administrator has determined that comprehensive air quality management strategy is needed to protect public health and welfare and to enhance the quality of our air resources. This air quality management strategy is based on the adoption and enforcement of State implementation plans approved by the Administrator and on new source performance standards promulgated by the Administrator. State implementation plans are designed to achieve and maintain national ambient air quality standards as required under section 110 of the Act, and new source performance standards are designed to facilitate the maintenance of national ambient air quality standards and enhance the nation's air resources as required under section 111 of the Act. Ideally, the Administrator should issue new source performance standards for all sources of particulate matter at one time. This would provide the maximum degree of enhancement of the nation's air resources. Clearly, EPA has neither the resources nor information to establish standards of performance for all sources of particulate matter at one time; therefore, a selection process is used which helps establish priorities for standard setting. In this selection process EPA examines uncontrolled emission rates, proximity to urban areas, stringency of State/local regulations, number of plants, and growth rates. A comparative analysis of some 80 sources of particulate matter showed asphalt concrete plants to be ranked within the first 20 source categories.
I-2	110	A joint industry-government task force should be established for a state of the art study of control technology for asphalt batch plants. EPA can't objectively assess the situation.	Such a task force is not necessary because the industry already has had considerable opportunity to present its views on, and information pertinent to, the proposed standard. Prior to proposal of the standard, EPA and the National Asphalt Pavement Association had over 14 meetings to review progress of the study. The standard was reviewed and approved by the National Air Pollution Control Techniques Advisory Committee (NAPCTAC). Review by NAPCTAC provides for input of opinions from industry, citizens groups, state and local air pollution control agencies, and members of the academic community during the standard setting process. This review provides for an unbiased assessment of the state of the art of control technology.
I-3	82, 86, 153, 156, 186	There should be a public hearing for the asphalt industry.	Section 111 of the Act provides for informal rule making wherein all interested parties have full opportunity to comment upon the proposed standard and its technical basis. The Agency reviews the comments received and explains in final rulemaking its reasons for relying upon or rejecting them. It is EPA's view that the Act does not require more. Prior to proposal of the standard, EPA and the National Asphalt Pavement Association had over 14 meetings to review progress of the study. Throughout the entire study, NAPA was kept

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
			informed of the progress. At the request of the asphalt industry, the House Subcommittee on Environmental Problems Affecting Small Business conducted a hearing on October 1,1973.
I-4	156, 169	The asphalt industry was not provided an opportunity to participate in the standard setting process.	EPA met with asphalt industry representatives over 14 times prior to proposing the standard. By submitting comments on the proposed standard to EPA during the comment period, the asphalt industry is again participating in the standard setting process.
I-5	29, 32, 190	Environmental impact of the proposed standard was not fully considered.	The effects on air, land, and water of the proposed standard were considered and are discussed in Volume 1 of this document.
I-6	156	EPA did not file an environmental impact statement as required by the National Environmental Policy Act (NEPA).	EPA is not required by NEPA to file an environmental impact statement. See the court's opinion in Portland Cement Association v. William D. Ruckelshaus.
I-7	21	Request a study on health effects and nuisance value associated with asphalt particulate emissions.	Such a study specifically for asphalt particulate emissions is not appropriate or necessary at this time. A health and welfare study for particulate matter was published by EPA in January 1969 Particulate matter was one of the pollutants for which a national ambient air quality standard was promulgated. Details are contained in Air Quality Criteria for Particulate Matter (AP-49)
I-8	55, 74, 78, 80 85, 90, 96, 128, 162, 177, 243	Particulate emissions from asphalt plants are not harmful and are similar to those from an unpaved road.	All particulate matter, regardless of whether it is from an unpaved road or an asphalt plant, is considered by EPA to have an adverse effect on health and welfare as evidenced by the fact that a national ambient air quality standard was promulgated for it.
I-9	145	Percent reduction in emissions is higher for asphalt plants than for other industries covered by a proposed standard. standard.	The standards reflect performance that the best system of emission reduction will attain for a particulate industry. Industry characteristics and control system performance vary from industry to industry. In the case of asphalt plants, the particulate emissions are such that high collection efficiencies are attainable. EPA is not required to present affirmative justification for different standards in different industries. See the court's opinion in Portland Cement Association v. William D. Ruckelshaus.
I-10	44, 52, 93, 106, 109, 118, 153, 201	The standard is more restrictive than required to maintain ambient air quality standards.	The objective of standards promulgated under section 111 of the Act is to prevent new air pollution problems from developing by requiring affected sources to use the best systems of emission reduction available at a cost and at a time that is reasonable. These standards are not intended to be related to ambient air quality. Attainment and maintenance of national ambient air quality standards is covered by State implementation plans as provided for under section 110 of the Act. It is not practical or meaningful to make general determinations of changes in ambient air quality that might be caused by new or modified sources. EPA does not know where such sources will be built, and many specific factors, such as topography, meteorological conditions, proximity of other pollution sources, and quantities emitted from all sources, will have great impact on air quality in specific locations.
I-11	51	State and local agencies will adopt the standard for both new and existing sources.	EPA has no legal authority over what State and local agencies do in this regard. As set forth under section 116 of the Act and 40 CFR 60.10, the promulgation of new source performance standards does not prevent State or local jurisdictions from adopting more stringent emission limitations for these same sources. In heavily polluted areas, more restrictive standards may be necessary in order to achieve national ambient air quality standards. The preamble to the proposed standards (38 FR 15406) clearly states that the costs of meeting the standards are considered reasonable for new and modified sources, it is not implied that the same costs apply to retrofitting existing sources.
I-12	93	EPA should study the efficacy of	EPA did study the efficacy of State regulations. See

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
		existing State regulations applicable to asphalt plants.	Volume 1 of the background document.
I-13	80, 90, 96, 111	EPA should publish the names of the manufacturers who claim their equipment will meet the proposed standard and should publish the warranties on the equipment.	The letters containing baghouse warranties are on file in the Emission Standards and Engineering Division of EPA, Durham, N. C. and are available for inspection.
I-14	7, 14, 16, 20, 23, 26, 27, 28, 32, 38, 48, 61, 64, 65, 71, 106, 110, 111, 132, 134, 153, 171, 186, 211	Manufacturers' guarantees do not protect a plant operator from economic losses due to lost production and to administrative and legal costs - i.e., manufacturers will not give unconditional guarantees.	The guarantees will not provide full damages when equipment fails to meet the standard, but they do reflect a degree of confidence in the equipment. If the equipment fails to meet the standard, the manufacturer would incur some liability, and if he knowingly made fraudulent representations as to efficiency of the control device he would be liable for all damages incurred as a result of his representations. Manufacturers would presumably not take such risks without a reasonable degree of confidence in their product.
I-15	72, 92, 96, 156	The standard should not apply to portable plants because EPA did not test any portable plants.	It is true that EPA did not test any portable plants; however, except for the mobility features, the design parameters of portable and stationary asphalt plants are basically the same. Therefore, there is no justification for not including portable plants under the standard Portable control systems are available having the same features and performance as do stationary control systems.
I-16	197	From the definition of affected facilities it is unclear if the standard applies to raw aggregate storage piles which are exposed and susceptible to wind carry-off of particulate matter	The standard does not apply to exposed raw aggregate storage piles. The revision to the proposed applicability section of the standard should help clarify this.
I-17	10, 14, 16, 25, 45, 47, 50, 51, 57, 65, 75, 81, 83, 128, 134, 153, 177, 185, 201, 203, 235	Normal replacement or modernization of facilities would require all 4800 existing asphalt plants to meet the standard.	As "modification" is defined under 40 CFR 60.2(h), normal replacement or modernization of a plant, which does not result in an increase in emissions, is not a modification and would not subject a plant to the standard. Only those changes which increase emissions would bring an existing plant under the standard. The applicability section of the proposed standard was revised to clarify the designation of affected facility.
I-18	201	When a portable plant is relocated, would it be considered "modified" and thus subject to the standard?	No. Relocation of a portable plant, in itself, would not be considered a modification under section 111 of the Act.
I-19	156, 243	Does transfer of ownership place an asphalt plant under the proposed standard?	No Transfer of ownership, in itself, does not constitute a modification under section 111 of the Act.
I-20	156	EPA surveyed 64 reportedly well-controlled plants and rejected 60 of these. The method of selection of plants for emission testing is subject to question	Our review of asphalt plants, with industry and State/local control officials, led to field visits of about 64 plants. All plants were not equally controlled. For instance, a plant with a low-pressure scrubber (which has a low collection efficiency for particulates) may have been an outstanding example of control for fugitive emissions and therefore support the visible emission standard. In addition, due to weather or mechanical failure, several plants were not operating when visited. Selection of plants for possible stack testing was narrowed to 12 plants. Those plants eliminated were judged on the non-inclusive basis of available emission data, conversations with plant operators/owners regarding control equipment problems and plant operation, and visible emissions ranging from 20 to 60 percent opacity. Five of the 12 plants were scheduled for test, but only four were tested because the fifth shut down for the winter. The other seven of the original 12 were not tested due to: (1) lack of suitable stacks for testing, (2) plant shutdowns for the winter, or (3) one installation used a fabric filter with an air-to-cloth ratio of 1.76-to-1 rather than the 6-to-1 normally used by the industry and a different fabric than normally used by the asphalt industry.
I-21	10, 19, 38, 59,	EPA failed to take the National	The data were taken into consideration and were reported in

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
	83, 84	Asphalt Pavement Association test data into consideration when setting the standard.	Volumes 1 and 2 of this document. Performance test results from two of the four plants tested were not used because of dust buildup in the clean side of the collectors and because the baghouses were operated with pressure drops outside the recommended range. This information was provided by the baghouse manufacturer's representative who inspected the baghouses before the tests were conducted.
I-22	13, 17, 19, 20, 23, 26, 42, 51, 59, 60, 80, 83, 85, 86, 96, 104, 122, 130, 132, 145, 162, 175, 179, 183, 186, 211, 227	EPA has not shown data from a sufficient number of sources to draw statistically valid conclusions about process variability and emission concentration levels from a well-designed and operated plant and its collection system.	Because the Act requires EPA to determine the "degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction) the Administrator determines has been adequately demonstrated," the data base upon which the standards are justified will always necessarily be limited. There is no requirement that EPA test all existing plants and base the standard on this information. Even though EPA was only able to test 4 plants, additional data were submitted to the Agency by industry and State/local air pollution control agencies for consideration. Since these additional data are not the sole justification for the proposed standard, extensive verification, beyond calculations and procedural practices checks, is not required.
I-23	83, 110, 156	EPA did not consider the results of EPA Contract #68-02-0076 in the standard setting process.	The test results from the 45 asphalt plants which were summarized in the contract report to EPA were considered in the development of the proposed standard, but were not used because the purpose of the contract was to obtain data for establishing emission factors for different types of control equipment, as typically installed, operated, and maintained. This information is used to estimate emissions and calculate ambient air quality trends. The fabric filter collectors tested under this contract were not representative of best control technology.
I-24	47, 62, 132, 169	EPA tests used for establishing the standard were not conducted at the plant's design capacity.	Three of the four plants tested by EPA were certified by the operators to be operating at capacity. The fourth was operating at 80 to 90 percent of capacity.
I-25	156	EPA failed to discuss the impact of the standard on mobile plants, continuous-mix plants, and drum-mixing plants.	EPA has discussed these three categories with NAPA on several occasions and with equipment manufacturers, the Federal Highway Administration, and control agencies. Specifically, EPA believes that: (1) The design parameters of portable and stationary baghouses are basically the same except for mobility features (2) The design parameters for collectors on continuous-mix plants are basically the same as for collectors on batch plants. (3) The drum-mix process is still in the developmental stages. In this process, most of the particulate is trapped by the asphalt in the dryer drum and uncontrolled particulate emissions are less than in a conventional plant. It may be possible to use a fabric filter collector, however, hydrocarbon compounds could condense on the fabric and cause maintenance problems.
I-26	59, 168	Startups and shutdowns increase emissions.	EPA recognizes that these operations may increase emissions, and separate regulations governing emission control during startups and shutdowns were issued in the Federal Register on October 15, 1973 (38 FR 28564).
I-27	113	The proposed standard (0.031 gr/dscf) can be met by asphalt plants in the Los Angeles County Air Pollution Control District.	No response necessary.
I-28	166	Our facilities will meet the proposed standard.	No response necessary.
I-29	99, 200	Agree with the proposed standard.	No response necessary.
I-30	12, 13, 14, 17, 18, 19, 21, 23, 26, 27, 29, 30, 36, 37, 38, 41, 42, 44, 45, 46,	The proposed standard of 0.031 gr/dscf cannot be attained either consistently or at all with currently available equipment.	After considering this comment and others and additional data submitted to the Agency after proposal, the proposed standard of 0.031 gr/dscf was changed to 0.04 gr/dscf for final promulgation. Chapter 3 of this volume includes a complete explanation of why the proposed standard was changed.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
	47, 51, 52, 53, 54, 57, 58, 59, 66, 67, 69, 71, 77, 79. 80, 81, 82, 83, 84, 85, 86, 88, 90, 97, 102, 104, 109, 112, 114, 115, 116, 117, 118, 119, 120, 123, 124, 127, 135, 136, 137, 144, 145, 146, 151, 152, 153, 154, 156, 157, 158, 159, 161, 162, 167, 168, 170, 171, 172, 175, 177, 183, 185, 186, 187, 188, 189, 190, 198, 199, 202, 208, 211, 213, 215, 216, 217, 218, 219, 220, 222, 223, 224, 225, 226, 228, 229, 230, 241, 242, 244, 246, 248		
I-31	42, 68, 82, 85 97, 101, 102, 126, 128, 135, 137, 156, 198, 207	The standard for particulate matter should be: (1) 0.06 gr/dscf, (2) 0.05 gr/dscf or greater, or (3) between 0.10 and 0.20 gr/dscf.	The proposed standard of 0.031 gr/dscf was changed to 0.04 gr/dscf for final promulgation. See Chapter 3 of this volume for an explanation of why the change was made.
I-32	38, 51, 59, 82, 83	The standard should be based on process weight.	In developing the proposed standard, process weight was considered as a basis but rejected. The reasons why the proposed standard was based on concentration are given on page 2, Volume 1 of this document.
I-33	18, 65, 84, 86, 92	The proposed standard (0.031 gr/dscf) cannot be achieved when fuel oils are used in the dryer. Some allowance for particulate generated by burning heavier grade petroleum products should be incorporated in the standard.	The proposed standard of 0.031 gr/dscf was changed to 0.04 gr/dscf for final promulgation. See Chapter 3 of this volume for an explanation of why the change was made.
I-34	24, 67, 168	There are no visible emissions from our baghouse but we don't know if it can meet the proposed 0.031 gr/dscf standard	No response necessary.
I-35	57, 60, 83, 113, 113A, 150, 153, 204, 208	The following comments were received on the proposed opacity standard: (1) The particulate standard and the opacity standard are incompatible. The opacity standard should allow emissions greater than 10 percent opacity for 3 minutes in any 1 hour (2) The opacity standard should allow emissions greater than 10 percent opacity but less than 40 percent opacity for up to 4 minutes in any one hour. (3) Opacity should be used as an indicator of compliance with the mass particulate standard, not as a standard in itself. (4) Opacity readings were reported in Volume 2 of the background document for only 3 of 15 plants tested. This is a rather meager substantiation of the opacity standard. (5) The opacity method (method 9) is unreliable and the opacity data do not provide a basis for setting any regulated level. (6) What is the reason for permitting a 2-minute exemption from the 10% opacity standard?	See the discussion of opacity standards in Chapters 2 and 3 of this volume.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
I-36	156, 169	EPA misquoted the results of Rylander report on correlation between particle size and capture efficiency of a fabric filter.	EPA did not misquote the Rylander study, as shown by Mr. Rylander's letter of July 17, 1973 to Mr. Fred Kloiber of NAPA in which he states "From our bench model filter tests we could not obtain a correlation between particle size and capture efficacy of a fabric filter."
I-37	156	Particulate emissions from cement plants have smaller fines content than do emissions from asphalt plants, yet both plants use similar control equipment. The new source performance standards permit higher levels of emissions for cement plants than for asphalt plants in apparent recognition of this.	EPA is not required to present justification for different standards for different industries. The essential question is whether or not the standard can be met by the affected industry and this is decided on the basis of information concerning that industry alone. See Portland Cement Association v. William D. Ruckelshaus. Control equipment used for the two industries is similar only in that baghouses are employed. The cement industry commonly uses baghouses with different design, with an air-to-cloth ratio of 2:1, and with a different fabric filter.
I-38	2, 7, 8, 32, 36, 40, 54, 57, 61, 64, 65, 69, 83, 89, 100, 101, 106, 110, 132, 169, 199, 241, 245	No consideration was given to the effect of the aggregate particle shape (e.g., spheres, needles) on the efficiency of the collector. The proposed standard can only be achieved when using dry, coarse aggregate mix	The effects of aggregate variations on baghouse performance have been investigated by EPA and by the asphalt industry. It is recognized that aggregate characteristics that affect particle size, shape, and lubricity vary among geographic locations. Particulate matter which is spherical in shape, has an average fineness below 5 microns, and is slippery and smooth will decrease the performance of a baghouse; however, available information indicates that aggregates used by asphalt plants do not produce particulate matter of this size and shape. EPA tests were conducted at plants having aggregate mixtures with fines (-200 mesh) ranging from 2 to 7 percent by weight. In general, the amount of fines in aggregate is approximately 5 percent. There may be some aggregates of which EPA is not aware that would have a size, shape, and lubricity that would affect control efficiency. The proposed standard of 0.031 gr/dscf was changed to 0.04 gr/dscf for final promulgation. See Chapter 3 of this volume for an explanation of why the change was made.
I-39	59	The moisture content of the incoming aggregate and the driec aggregate should be described in Volume 1 or 2 of the background document because it affects collector efficiency.	This information was omitted because it is not considered relevant to the standard. The moisture content of the incoming aggregate determines the dryer capacity. In general, dryers are designed for aggregates with 5 percent moisture. When the moisture exceeds 5 percent, dryer capacity is decreased. Aggregates will drain to a moisture content of approximately 8 percent; therefore, 8 percent is the maximum moisture content found in the incoming aggregate.
I-40	20, 40, 41, 47, 67, 81, 106	The standard should take into account the effect of ambient humidity on the ability to control particulate emissions.	No relationship exists between ambient humidity and control of emissions, provided the temperature of the gases in the baghouse is kept above the dew point.
I-41	197	Does the emissions records requirement, section 60.93, mean that records of opacity measurements must be kept?	No
I-42	145	Clarify section 60.94(d)(1) so it is understood that only the front half of the EPA train is used in determining compliance, not the entire train.	This is not necessary because method 5, which is referenced as the test method under 60.94(d)(1), does not require measurement of anything except the particulate matter collected in the probe and filter, the particulate matter collected in the wet impingers is not determined. The impingers are optional in the sampling train and can be replaced by an equivalent condenser.
I-43	197	A stack is required in order to use method 5 as required by section 60.94(d). Does this preclude the use of a pressurized baghouse?	No. Pressurized baghouses may be used with a stack so that method 5 can be used. As provided under section 60.8(b), the Administrator may approve an alternative method or waive the performance test requirement if the owner or operator can demonstrate compliance by some other means.
I-44	197	A large proportion of particulate emissions from asphalt plants is collected in method 5 impingers. The full EPA train should be used as the test method because any fraction not collected in the impingers will contribute to measured ambient	The method was changed in response to comments received when the first group of standards was proposed. The rationale for changing the method is still considered to be valid. Until more information is received which indicates the need for use of the full train catch, method 5 will consist of the front half only (probe and filter catches only)

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
		levels of suspended particulate.	
I-45	82	A 0.03 gr/dscf, EPA method 5 is unreliable and its reproducibility is on the order of ± 100 percent.	Preliminary analyses indicate that method 5 is reproducible within a factor of ± 10 percent. This is considered adequate for testing stack emissions. Preliminary data are available in EPA files in Durham, North Carolina.
I-46	208	Precision and accuracy of method 5 have not been established.	It is true that the precision and accuracy of this method have not been definitely established; however, preliminary data based on field tests are available that indicate an interlaboratory precision (reproducibility) of ± 10 percent. Error analysis of the testing equipment variables indicates that the method has an intralaboratory precision (repeatability) of ± 6 percent. Studies of method accuracy are hampered by the lack of a facility for generating known concentrations of particulate matter. Such a generator is under construction and accuracy studies are expected to be completed in 1974
I-47	63, 83, 156, 169	In the emission tests, EPA failed to follow method 5 in the following ways: (a) Sample time was less than 5 minutes at each point. (b) Sample time was less than 60 minutes. (c) Three repetitions were not performed in all tests of plants. (d) Dimensions of the stack and numbers of tests points on the traverse were not given in in the reports. (e) Samples were not within the range 90 to 100 percent isokinetic. (f) Dilution air was not determined.	All of these points are true, however, the deviations from method 5 are so minor that the test results are still considered valid. It must be pointed out that method 5 plays a dual role (1) it serves as the method for data gathering during the development of a standard of performance and (2) it serves as the method for determining compliance (during a performance test) of new or modified sources covered by a performance standard Testing during the standard development process is done primarily on sources that were retrofitted with control equipment and that are not necessarily designed to facilitate testing. In addition, EPA data-gathering tests are conducted during the normal production run of a process, thus, testing duration is controlled by the operation schedule of the plant This is unlike testing which would be performed during a performance test. The objective of method 5 is to set forth a uniform procedure for determining particulate emissions with maximum accuracy and precision under a variety of conditions. There are procedures in the method which, subject to engineering judgment, can be considered flexible in certain cases without sacrificing the reliability of the test results Method 5 is being revised to clarify this point. Deviations from the specified procedures are however, subject to approval by the Administrator. The data concerning dimensions of stacks and numbers of test points are available in EPA files in Durham, North Carolina A review of these data indicates that the number of traverse points used conforms to method 1. The failure to include these data in the test reports was an oversight. The results included in the test reports were reviewed and some calculation errors were found Correction of the errors indicated that all of the samples had been obtained within the range of 90 to 100 percent isokinetic flow conditions. "Dilution air" is considered to be air which is added to a gas stream for the purpose of diluting the concentration of particulate matter in order to comply with an applicable standard. Dilution air was not added during any test. The percent excess air was calculated from the Orsat analysis, and the results are reported in the test reports on those plants tested by EPA
I-48	11, 19, 82, 225	EPA should conduct a comparative cost-benefit study for an 0.06 gr/dscf standard and the proposed standard (0.031 gr/dscf)	A cost benefit analysis, showing the benefit to ambient air conditions as measured against the cost of the pollution control devices required to meet a standard is not a requirement in considering costs. See Portland Cement Association v. William D. Ruckelshaus.
I-49	19, 32, 46, 85, 144, 153, 241	Asphalt plants cannot afford the control costs required by the proposed standard.	The proposed standard (0.031 gr/dscf) was changed to 0.04 gr/dscf for final promulgation. It is our judgment that the incremental investment required by the final standard will generally not create any serious additional financing problems for new asphalt concrete plants The February 1972 Economics of Clean Air concluded that asphalt concrete plants meeting State emission standards

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
			should be able to increase prices to cover the added cost of pollution control. Because the annual cost for a new plant meeting the final standard closely approximates the cost for an existing plant meeting a typical State standard, our judgment is that a new plant will not be placed at a competitive disadvantage. These judgments have been reinforced by NAPA's public comments that were submitted to EPA on July 24, 1973. On page 49 of their comments they stated: "The National Asphalt Pavement Association, as it has indicated on many occasions to EPA, submits that the legitimate goal of protecting the environment and reducing emissions will be achieved by the imposition of a .06 standard rather than the .031 standard. It is submitted by the industry that this will result in an improvement of the emission levels by 99.8%, and is consistent with the goal which has been stated, of 99.7% by the Environmental Protection Agency. Further, it is submitted that the reduction is achievable at a reasonable cost without unduly endangering the existence of the industry or forcing the use of other alternative products. Thus, it is submitted that it is important that the standard be .06 and not .031." "It is important that it be recognized that if the standard is .06, the equipment which will be required to be purchased will be either a venturi scrubber with a minimum 20-inch pressure drop or a baghouse with a 6 to 1 air-to-cloth ratio. It is submitted that there will be a significant improvement in the environment with an .06 standard. The .06 standard will further require that the plants be kept in good operating repair and condition or they will fail to meet the .06 standard. A .06 standard will avoid the problems of the size and shape of the particulates and also other problems which cannot be answered at the present time." NAPA's conclusion is that the cost for a venturi scrubber with a 20-inch pressure drop or a baghouse with a 6:1 air-to-cloth ratio is reasonable. It is EPA's contention that this equipment will achieve the final standard (0.04 gr/dscf) Thus, NAPA's conclusion that cost for this type of equipment is reasonable reinforces our judgment that the cost to meet the final standard is reasonable.
I-50	7, 12, 14, 16, 18, 23, 25, 26, 27, 28, 29, 30, 33, 50, 54, 57, 65, 67, 69, 72, 75, 81, 89, 107, 112, 121, 128, 140, 145. 147, 153. 168, 185, 198, 230, 235	The small operator cannot afford to install control equipment and will be forced out of business.	The costs of the standard to an owner or operator are considered reasonable for all sizes of plants; there is no economic penalty to small plants. The standard does not apply to existing plants. If a small operator decides to modify an existing plant or build a new plant, Comment no. will add about 6 to 10 percent to the cost of a plant designed to comply with State regulations. See response to comment I-49 regarding reasonableness of the costs.
I-51	39, 41, 84, 102	EPA stated that 30 to 40 percent of small operators would be forced out of business.	This estimate, from the February 1972 Economics of Clean Air, applies to costs for complying with State Implementation Plans, not with the proposed new source performance standard.
I-52	10, 21, 41, 57, 65, 74, 84, 89, 100, 101, 120, 145, 156, 170, 220	The standard will stifle growth of the asphalt industry and development of new and better equipment.	As indicated in the preceding comments, costs are reasonable. It is therefore difficult to see why normal growth and development should not occur.
I-53	25, 31, 33, 65, 74, 88, 89, 92, 96, 101, 149, 172, 199	The proposed standard will increase highway construction costs.	The standard will increase the cost of asphalt concrete about $0.02/ton over the cost of meeting normal State regulations, which is $0.20/ton more than costs for asphalt concrete produced in uncontrolled plants. Two cents per ton amounts to 1/4 of 1 percent of the price of an $8.00 ton of asphalt. Since asphalt concrete represents only 20 to 40 percent of highway construction costs, the effect on highway construction should be miniscule.
I-54	145	Costs for control of particulate emissions are greater for	The Act does not require that control costs be the same for all industries affected by new source performance standards.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
		asphalt plants than for the other Group II industries.	
I-55	156	EPA has miscalculated the economic cost of the proposed standard since the number of plants becoming subject to the standard will increase substantially, even assuming no new plants will be needed to meet increased demand. NAPA claims that 480 plants will require replacement each year.	EPA's cost analysis is based on a "model plant;" costs are calculated for this design and size plant. The total number of plants subject to the standard is not pertinent if cost per plant does not increase substantially. If indeed 480 plants will be subject each year to the standard, then this is all the more reason for need of a standard.
I-56	156	EPA has erroneously estimated that the annual growth rate for the asphalt concrete industry is 10 percent.	The 10 percent growth figure was based on production figures for 4 years. During the last 10 years the rate was only 6.6 percent. The rate for the last 3 years was 2.2 percent. EPA has revised the growth rate figure to 5 percent on the assumptions that: (1) the 2.2 percent figure is abnormally low and (2) a slowdown of interstate highway construction will probably make the 6.6 percent figure too high.
I-57	25, 84, 87, 109, 146, 170, 203	EPA has ignored the projected power requirement involved.	The power requirement was considered in the economic analysis of the standard.
I-58	17, 26, 83, 84, 220, 245	No control cost estimates are provided for retrofitted, modified plants.	Cost estimates for retrofitting were not considered necessary because the cost to control a modified plant would not be higher than to control a new plant. Sources are considered "modified" under the Act only when modification results in increased emissions. Costs will ordinarily be lower for retrofitting modified plants than for installing control equipment in new plants because modified plants often have much of the necessary ductwork, electrical switchgear, etc.
I-59	145	Control costs will increase the cost of new or modified equipment by 24 percent.	Most of the increase is due to State and local air pollution regulations that require low-energy scrubbers. Only 7 to 10 percent of this increase will result from meeting the standard of 0.04 gr/dscf.
I-60	106, 156	Estimated control costs per ton of asphalt are incorrect because costs are based on an on-stream time of 50 percent and on a 100 percent capacity production. NAPA claims that 1972 annual production was 25 percent of the total installed capacity.	NAPA gathered data from its 657 member firms, each of which has an average of 2.75 plants. These plants each average 180 tons/hr capacity and operate about 1500 hrs/yr. Therefore full capacity would amount to: (657 firms)(2.75 plants/firm)(180 tons/hr)(1500 hrs/yr) = 487,800,000 tons/year The 1972 production by NAPA members was 240,500,000 tons, which is 49 percent of capacity. Since EPA used 50 percent of capacity, the costs are deemed correct.
I-61	10, 13, 17, 24, 28, 33, 39, 53, 55, 61, 73, 78, 84, 106, 122, 126, 132, 134, 177, 183, 220, 245	EPA control cost estimates are too low. A more typical figure to bring an installation into compliance is $80,000 to $600,000 - an added cost to the product of $0.36/ton.	EPA has reviewed and revised the cost estimates and they compare favorably with the range of the eight estimates provided by NAPA. The revised economic analysis is included as Appendix B of this document.
I-62	61	Control cost estimates do not include lost income due to lost production during installation and adjustment of a control unit.	There should be no lost production time due to installation and adjustment. In a new plant, or in a plant being extensively modified, the control device construction should be completed simultaneously with, or before, the rest of the plant. Since NAPA tells us that plants operate only 8 to 10 hours a day, there is ample time for adjustments and "fine tuning" of the control device. Therefore, no costs were assigned to lost production time.
I-63	11	Cost estimates for a low-pressure venturi scrubber are too high. Costs will more likely be around $10,000.	The Percy Todd Manufacturing Company enclosed copies of invoices to show that their basic unit costs $8025. This cost, adjusted for 1971 dollars, compares closely with the $8800 cost for an IGCI unit for the same size plant. The larger EPA figure includes the cost of interconnecting ductwork, primary collector, wet scrubber, fan, slurry pumps, settler and clarified water return pumps, and sludge tank. This brings the total to about $22,000. Another $26,000 is required for installation. When all factors are taken into account, the investment costs for a Todd unit would be very close to those for EPA units
I-64	156	To consistently achieve the proposed standard (0.031 gr/dscf), a baghouse must have	The proposed standard was changed to 0.04 gr/dscf for final promulgation. The reasons for the change are given in Chapter 3 of this volume of the background document. A

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
		an air-to-cloth ratio lower than 6:1. Costs to achieve the 0.031 gr/dscf standard using a 4:1 rather than a 6:1 air-to-cloth ratio increase by 40 percent.	baghouse with a 6:1 air-to-cloth ratio should meet the 0.04 gr/dscf standard if it is properly designed, installed, operated, and maintained.
I-65	156	EPA's cost estimate of $9.00/ton for mineral filler is incorrect; it should be around $3.39/ton.	The $9.00 value was based on information from trip reports. Valid information from the National Crushed Stone Association supports the $3.39/ton figure. EPA calculations have been adjusted to reflect the lower value.
I-66	61	Some States won't allow the use of collected fines in asphalt concrete.	Although this may be true for certain types of asphalt concrete, it is not considered a significant problem. This situation is considered in the economic analysis; however, it does not increase costs to the extent that they become unreasonable. For a fabric filter without recycle equipment, investment costs would be 10 to 15 percent lower, but operating costs would be $0.02 to $0.03 per ton higher.
I-67	57	Manpower costs caused by the monitoring and record-keeping requirements were not considered.	No monitoring equipment is required and record keeping is limited to filing the original test data. Therefore, there are no manpower costs.
I-68	30, 57, 90, 96, 111, 162	Do not want to buy the expensive equipment required for monitoring and testing.	Because there are no continuous monitoring equipment requirements and because performance tests may be conducted by a consulting firm or control equipment vendor, there need be no testing equipment costs.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
		Subpart J. Petroleum Refineries	
J-1	197	Fluid coking units should be listed as an affected facility.	No data concerning emissions from such units have yet been collected by EPA nor have the systems for emission control yet been studied.
J-2	105, 125, 131, 163, 164, 173, 181, 182, 184, 205, 209, 210, 239, 240	The definition of "petroleum refinery" used in the regulation could be interpreted as including crude oil production facilities, gas plants, and natural gasoline plants. The definition should be revised to apply only to petroleum refineries.	Agree. The definition has been made more specific to prevent misinterpretation.
J-3	131, 163, 197	The definition of "petroleum" used in the regulation excludes the petroleum extracted from shale, tar sands, and coal. Shouldn't such petroleum be included?	Yes. The definition has been changed to clearly include petroleum extracted from shale, tar sands, and coal
J-4	125, 131, 141, 163, 181, 205	The definition of "hydrocarbon" is too broad and ambiguous.	This definition is no longer required and has been deleted from the promulgated regulations
J-5	128, 141	The definition of "process gas" should have included the non-hydrocarbon gases produced by various process units in a refinery	The definition has been revised to include all gases produced by process units in a refinery except fuel gas and process upset gas.
J-6	105, 143, 184, 239	"Fuel gas" should be defined only as gas burned in heaters and boilers to avoid having H_2S standard apply to stack gases from fluid catalytic cracking catalyst regenerators (FCCCR) and fluid coking unit coke burners (FCUCB).	Agree The definition of "fuel gas" has been changed to include only those gases generated by a refinery process unit and combusted as a fuel. Both the FCCCR stack gases and the FCUCB stack gases are exempt from the H_2S standard.
J-7	105, 143, 163, 176, 182, 184, 239	The definition of "waste gas disposal system" should clearly indicate that emergency flare systems are not included so that the H_2S standard does not apply to the emergency flare systems.	The H_2S standard applies to flare systems as well as process heaters and boilers. However, the standard is not applicable to flare systems when the flare is used as a safety device under emergency conditions. The standard has been revised to clarify this distinction.
J-8	184	In the economic analysis, the credit for the useful energy derived from a CO boiler should not be used to reduce the debit for the installation and use of an electrostatic precipitator (ESP).	A CO boiler credit was not used to offset ESP costs. See pp. 22-23 of Volume 1 of this document for separate analyses of the costs. On the basis of these separate analyses, the costs for compliance were judged to be reasonable.
J-9	49, 174, 184, 221	The costs of amine treaters and Claus plant tail-gas scrubbers should be included in the economic analysis for H_2S control Small refineries cannot afford such equipment and should be exempt from the H_2S standards.	EPA agrees that amine treater costs should be included, particularly as related to small refineries which might not otherwise install such equipment This cost analysis has now been completed and small-unit costs are considered reasonable. See Chapter 4 and Appendix C of this volume for details of the analysis. The costs of Claus plant tail-gas scrubbing are not included in the economic analysis because such scrubbing is not needed to comply with the standard.
J-10	105, 163, 174, 191, 195	The cost to control a small fluid catalytic cracking unit (FCCU) would be prohibitive. Some provision should be made to exempt small FCCUs, or the standard should be relaxed.	EPA has analyzed small-unit costs and found them to be reasonable. See Chapter 4 and Appendix C of this document for details of the analysis
J-11	113, 131, 141, 163, 182	The facilities to which the standards apply should be specifically identified in the regulation.	The regulation has been revised to identify clearly the specific affected facilities.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
J-12	197	The particulate emission standard appears to be unduly restrictive when compared with the Group I standard for power plants	EPA is not required to present justification for different standards for different industries. The essential question is whether or not the standard can be met by the affected industry and this is decided on the basis of information concerning that industry alone. See Portland Cement Association v. William D. Ruckelshaus.
J-13	131, 197	Regulations on burning of sulfur-containing fuel in refineries should not be more restrictive than regulations on burning of sulfur-containing fuel in other facilities such as Group I utility boilers	See response to J-12.
J-14	166	Boilers of less than 250 million Btu/hour heat input should be exempt from the standard to be consistent with the Group I standard for power plants and to reduce recordkeeping	See response to J-12. Many refinery boilers smaller than 250 million Btu/hour heat input should and can comply with the standards.
J-15	112	The regulation does not specify a standard basis to which concentration of SO_2 should be calculated if compliance testing of the combustion gases is performed. Circumvention of the standard is thus possible by use of excess air	A paragraph added to the General Provisions (subpart A, 40 CFR 60) prohibits the use of dilution air and other circumvention techniques to achieve compliance with any new source performance standard. The petroleum refinery standard has been changed to require that an owner or operator who elects to control SO_2 emissions by methods other than removal of H_2S before the gas is burned must demonstrate to the satisfaction of the Administrator that equivalent control is achieved.
J-16	105, 163, 239	Although it may be feasible to attain particulate emission concentrations of 0.022 gr/dscf when the control equipment is new, it is very difficult to attain this continually over life of equipment. The standard should be revised to 0.04 gr/dscf	Long-term data gathered by EPA on particulate emissions from precipitators operating on fluid catalytic cracking units in the petroleum industry and in other applications in other industries indicate that, with good maintenance, precipitators will continue to operate at a high efficiency, meeting or exceeding design conditions and specifications for the life of the equipment. Detailed discussions with the major vendors serving the petroleum refinery industry confirm this. See Chapter 4 of this volume for an additional discussion of this point.
J-17	184	Continual compliance with the proposed particulate regulation is not possible, the regulation should be revised to require average emission concentrations of 0.022 gr/dscf but permit maximum emission concentrations of 0.044 gr/dscf	See response to J-16.
J-18	184	The 3-minute/hour exemption period allowed in the opacity standard for soot blowing is too short. Industry experience shows 5 minutes is more reasonable	See the discussion of opacity standards in Chapters 2 and 4 of this document (Volume 3).
J-19	197	With particulate emission concentrations of 0.022 gr/dscf, the plume should not be visible. Opacity standard should be no visible emissions rather than 20 percent	See the discussion of opacity standards in Chapters 2 and 4 of this document (Volume 3).
J-20	105, 163, 181, 184, 239	Vendors refuse to guarantee opacity of emissions. Industry data show that to consistently meet a 20 percent opacity regulation, grain loadings must be less than 0.01 gr/dscf, much less than 0.022 gr/dscf. Thus opacity should be used as a guide to determine when a source test is necessary to check compliance.	See the discussion of opacity standards in Chapters 2 and 4 of this document (Volume 3).
J-21	205, 251, 253	Where the precipitator precedes the carbon monoxide boiler, the proposed particulate matter regulation permits dilution by the carbon monoxide boiler flue gases. Where the precipitator follows the carbon monoxide boiler, such dilution is not possible. Thus, the regulation is lenient if the boiler follows the precipitator	Agree. Under the proposed regulations two identical fluid catalytic cracking unit catalyst regenerators could discharge different volumes of gases to the atmosphere, depending on the placement of the CO boiler with respect to the electrostatic precipitator. The promulgated regulations are based on coke burn-off rate in the catalyst regenerator; thus particulate emissions do not depend on the volume of gases discharged to the atmosphere, so placement of the CO boiler with respect to the electrostatic precipitator has no effect on particulate emissions

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
J-22	197	Why are allowances given for incremental increases in particulate emissions if liquid or solid fuel is burned in the carbon monoxide boiler?	All the fluid catalytic cracking catalyst regenerators tested and studied by EPA were burning natural gas in the CO boiler. However, during certain months of the year natural gas is not available and liquid fuels must be used instead. Since the combustion of liquid (or solid) fuels will increase particulate emissions, an allowance for liquid or solid fuel is included in the regulation, based on the Group I utility boiler standards.
J-23	105	Just as an allowance is made for incremental increases in particulate emissions if liquid or solid fuel is burned in carbon monoxide boilers, the standard should include an allowance for the burning of gaseous fuel.	Units tested by EPA were burning gaseous auxiliary fuel, so the standard takes this into account.
J-24	105, 176, 182, 184	Regulations should be revised to state specifically what monitoring requirements are necessary on what affected facilities.	Agree. The regulations have been so revised.
J-25	131	Monitoring requirements should apply only if emissions are above some specified level.	Monitoring instruments are necessary to ensure proper operation and maintenance of emission control systems.
J-26	131	Monitoring of firebox temperature is not necessary.	Monitoring of both firebox temperature and oxygen content of gases is necessary to ensure oxidation of CO to CO_2.
J-27	176, 182	Requiring the maintenance of separate records and files for pollution control information is unreasonable The use of operating unit log sheets would be adequate.	Operating unit log sheets record spot values at wide intervals. These data are not adequate to ensure proper operation and maintenance of the emission control system.
J-28	113, 163, 166, 176, 184	The regulations need to be revised to specifically state whether H_2S is to be monitored at each heater, boiler, and flare system or for the fuel gas system as a whole.	The regulations have been revised to permit the monitoring of H_2S in the fuel gas system as a whole
J-29	113	The regulations should require monitoring of H_2S at points before refinery fuel gas streams are blended to prohibit meeting the regulation by blending.	The standard is based on blended fuel gas streams since this is a common refinery practice However, blended fuel gas streams commonly contain H_2S in considerably greater concentrations than 230 mg/dscm, and the purchase of large volumes of natural gas for blending with refinery fuel gas merely to reduce the H_2S concentration of all fuel gases to below 230 mg/dscm is not likely to be a practical alternative to treating the fuel gas to remove H_2S
J-30	167	There is no need to monitor the fuel gas system continuously The control room instrumentation will indicate if amine scrubbing units are operating normally.	The parameters monitored in control rooms to determine proper operation do not reflect the hydrogen sulfide concentration nor do they indicate how well it is controlled
J-31	197, 163, 204	Release of gases to the atmosphere should not be permitted if such gases contain hydrogen sulfide (H_2S) in concentrations greater than 230 mg per dry cubic meter at standard conditions Incineration of such gases should be required Unburned H_2S should be monitored in stack gases.	The standard applies to emissions for sulfur dioxide (SO_2), not H_2S, and restricting the release of H_2S to the atmosphere does not control SO_2 emissions. Because H_2S released to the atmosphere would cause a stench, common practice in most refineries is to flare gases containing H_2S. However, SO_2 is formed when H_2S is burned, so the most effective way to control SO_2 emissions is to remove substantial amounts of H_2S from gases before they are burned, as the regulation requires.
J-32	143, 163, 166, 174	There is no need to keep a daily record of the production rate for the fluid catalytic cracking unit.	Agree This requirement has been removed from the regulation.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
		Subpart K. Storage Vessels for Petroleum Liquids	
K-1	95, 105, 131, 143, 164, 165, 166, 176, 181, 182, 184, 195, 210, 239, 240	Exempt storage of crude oil and condensate at producing facilities in the field from the standard. Reasons given included: (1) the large cost differential in switching from the bolted-construction, fixed-roof tanks in common use to the welded, floating-roof tanks needed for compliance with the standard; (2) the very small emissions of those hydrocarbons which contribute to the formation of photochemical oxidants; (3) the relatively small size of these tanks and their commonly remote locations; and (4) the understanding that EPA did not intend to make the standard apply to such tanks.	It was EPA's intent to exempt such storage vessels. The regulation has been amended to clarify this. The exemption applies to storage between the time that the oil and condensate are removed from the ground and the time that custody of these products is transferred from the well or producing operations to the transportation operations.
K-2	108	Increase tank size exemption to 320,000 liters (84,500 gallons) as this is the most common size used in storage of diesel fuel and pipeline interfaces, which are normally of low volatility	Diesel fuels are exempt from the standard. Interfaces of low volatility, i.e., less than 1.5 psia true vapor pressure, are exempt.
K-3	240	Increase size of all storage tank exemptions to 50,000 barrels (2,000,000 gallons) as this is the most economical size	EPA's economic data do not support this contention. The data indicate that the exemption threshold is reasonable.
K-4	34, 95, 105, 108, 131, 164, 166, 167, 181, 184, 209, 238, 240	The definition of "storage vessel" is too broad. It includes subsurface caverns, porous rock reservoirs, and high-pressure tanks capable of operating at pressures sufficiently high to prevent emissions to the atmosphere. These types of storage are optimum for preventing the release of emissions to the atmosphere and require no additional control devices	Agree. The regulation has been amended to exclude such storage.
K-5	35, 91, 95, 131, 232	The definition of "petroleum liquid" is too broad. It can be considered as encompassing any products made from petroleum, including petrochemicals, and these products were not studied by EPA.	The definition has been amended to clarify applicability.
K-6	105, 184, 236	The definition of "floating roof" does not include covered floating roofs and internal floating covers, which are surely acceptable as control devices	Agree. These devices are acceptable. The definition has been amended to include such devices.
K-7	35, 125, 143, 184	The definition of "vapor recovery system" can be interpreted to demand complete, 100 percent recovery — an impractical demand.	This was not EPA's intent. The use of the word "prevent" is not meant to imply total stoppage, and this is made clear in the preamble to the promulgated regulations.
K-8	15, 105, 125, 139, 142, 143, 163, 231, 239	The standard should not require conservation vents on storage vessels when the true vapor pressure of the petroleum liquid stored is 78 mm Hg or less because (1) such vents become fouled when some heavy liquids are stored and when ice forms on the vents during cold weather, and (2) the beneficial effect on emissions is minimal.	Agree. Regulation is amended to exclude the requirement for conservation vents.
K-9	3, 9, 22, 70	The proposed standard duplicates state rules and regulations and is not needed. It should be dropped where existing state plans are in effect.	The intent of new source performance standards under section 111 of the Clean Air Act is to require nationwide the best adequately demonstrated, economically reasonable system of emission controls. There is no provision for exempting facilities located in states where good state regulations require similar control of emissions.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
K-10	3, 9, 22, 35, 70, 95, 105, 108, 142, 143, 150, 163, 166, 176, 181, 182, 184, 197, 210, 231, 237, 239, 240	The monitoring requirements impose a heavy expenditure of manpower and money to collect, record, and retain information that is not really needed. For example: (1) recording daily tank temperatures for the thousands of tanks in remote tank farms, terminals, and marketing operations is impractical and not needed, (2) most products are manufactured to specifications and have typical vapor pressures over reasonably narrow ranges. These can be used instead of the required daily sampling and analysis to determine true vapor pressures, and (3) surely there is no intent to demand constant compliance and surveillance.	The regulation has been amended to reduce the monitoring requirements. The requirements were based on the information-gathering facilities which were known to exist at modern refineries, and the comments and EPA's subsequent follow-up clearly showed that the operators of remote tank farms, terminals, and marketing operations would have been unjustifiably burdened.
K-11	105, 113, 176, 184, 197, 238, 239	The storage vessel maintenance requirements are not workable because: (1) the colors and types of paints to be used on tanks are not specified, (2) some localities require paints that blend with the location, (3) the desired condition of the seal is not specified, and (4) it is not reasonable to require that sampling ports on floating-roof tanks be gas-tight.	The maintenance requirements have been removed from the regulation. The intent was to ensure that good maintenance practices were employed, and the requirements were not sufficiently explicit for this purpose. A recently published change to subpart A (40 CFR 60), General Provisions, requires that all facilities subject to new source performance standards must be, to the extent practicable, operated and maintained in a manner consistent with good air pollution control practice for minimizing emissions. This will achieve the purpose for which the proposed storage vessel maintenance requirements were intended.
		Subpart L — Secondary Lead Smelters	
L-1	204	The term "reverberatory furnace" should not be used to define a reverberatory furnace.	The intent was to show the types of reverberatory furnaces that were covered by this regulation. The definition has been revised to clarify this intent.
L-2	204	"Pot furnace" and "cupola" should be defined.	The terms were intended to convey the same meanings as those generally accepted in the industry, and no definitions were considered necessary.
L-3	62, 113, 196, 204	The opacity standards should be changed for the following reasons: (1) there is no basis for the 2-minute/hour exemption, (2) an upper limit should be established for the exemption period, and (3) the opacity standard cannot be met by smelters that meet the concentration standard.	See the discussion of opacity standards in Chapters 2 and 6 of this document (Volume 3).
L-4	196	Why is the particulate standard for secondary lead blast and reverberatory furnaces 0.02 gr/dscf when the data support a limit of 0.01 gr/dscf?	Test data serve as a guideline for setting standards, but other factors must be considered as well, the application of engineering judgment is an important part of standard development. In this particular case, the following facts influenced the choice of the number for the standard: (1) designers and manufacturers of control equipment will guarantee concentrations between 0.015 and 0.020 gr/dscf, and (2) EPA did not want to exclude the use of scrubbers as an applicable control device. The test data indicate that a high-pressure-drop scrubber cannot consistently reduce particulate emissions to 0.01 gr/dscf but that it should be able to achieve 0.02 gr/dscf.
L-5	62	EPA should have proposed standards to control SO_2 emissions because these emissions may result in violation of ambient air quality standards.	Ambient air quality is protected under section 110 of the Clean Air Act. New source performance standards are promulgated under section 111 of the Act to prevent future problems from developing by requiring the use of the best system of adequately demonstrated control that is economically feasible. Time and money dictate that some pollutants must be dealt with before others. During EPA's study of secondary lead smelters and refineries, it appeared sensible to defer standards for control of SO_2 emissions until standards for more significant emissions had been set.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no	Commentator no.	Comment	Response
L-6	113	The size below which pot furnaces are exempt from the standard (550 pounds charging capacity) should be increased. Owners of such very small pot furnaces, i.e., less than one cubic foot of capacity, should not be bothered with conducting the performance tests and submitting the information required by EPA.	The only standard applicable to pot furnaces is the opacity standard. The owner of a pot furnace is not required to conduct the stack tests required of owners of blast (cupola) or reverberatory furnaces.
L-7	196	Emissions from bypasses should be controlled.	Such emissions are prohibited by a revision to subpart A of the General Provisions (40 CFR 60), which requires that all facilities subject to new source performance standards must be, to the extent practicable, operated and maintained in a manner consistent with good air pollution control practice for minimizing emissions.
L-8	62, 196	Fugitive dust emissions should be controlled.	See response to L-7.
L-9	62	New secondary lead smelters should be required to locate in areas where exposure of humans and domestic animals to lead fallout will be minimized.	Section 110 of the Clean Air Act requires the states to provide implementation plans that include a procedure for reviewing the locations of new sources and preventing their construction if attainment or maintenance of ambient air quality standards will be prevented thereby.
L-10	62, 196	The proposed standard should also apply to existing smelters.	This standard is promulgated under section 111 of the Clean Air Act, which applies only to new or modified sources. Existing stationary sources are regulated by implementation plans under section 110; these plans are formulated and enforced by the states but must be approved by EPA.
		Subpart M Secondary Brass and Bronze Ingot Production Plants	
M-1	129	The brass and bronze ingot industry is not a significant source of air pollution, no new source performance standard should be promulgated for this industry.	As with all sources for which new source performance standards have been or will be specified, secondary brass and bronze ingot production plant emissions were considered first in the uncontrolled state. Certainly, uncontrolled, these plants would be significant sources of air pollution. The plants which operate today control emissions to various degrees. State and local regulations vary in the limitations imposed on such emissions. No single standard is accepted nationally. The best system of emission control is not found or required in all locations. The intent of new source performance standards is to ensure that future plants, and existing plants if they are substantially modified, apply, as required by section 111 of the Clean Air Act, " . . . the best system of emission reduction which (taking into account the cost of achieving such reduction) the Administrator determines has been adequately demonstrated." Thus, a new or modified significant source of air pollution must apply the best system of emission control regardless of its location.
M-2	129, 150, 204	The visible emission standard should be changed because (1) condensed water vapor might be mistaken for emissions of particulate matter; (2) baghouses result in "no visible emissions" rather than in "less than 10 percent opacity", (3) there is no basis for the 2-minute/hour exemption; (4) there should be a maximum opacity allowed during exemptions, and (5) some normal operations last longer than 2 minutes and result in emissions above the standard.	See the discussion of opacity standards in Chapters 2 and 7 of this document (Volume 3).

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
M-3	204	The term "reverberatory furnace" should not be used to define a reverberatory furnace. The definitions of electric and blast furnaces should also be revised.	The intent of the definition of reverberatory furnace was to identify the types of reverberatory furnaces covered by this regulation, the definition has been revised to clarify this intent. The definitions of electric and blast furnaces are considered adequate.
M-4	129	It is not clear if the performance test is to be conducted while the affected facility is operating at the maximum production rate or while the control device is operating at its maximum rate; conditions at a plant may differ since several affected facilities are sometimes vented to the same control device.	The intent is to test emissions while the air pollution control device is controlling emissions from the number of furnaces that it would normally control, these furnaces would then be required to operate at their maximum production rates Where only some of these furnaces are affected facilities (i e , new or modified furnaces), then the Administrator's representative at the test will determine representative conditions. Recent changes to the General Provisions (Subpart A) make it clear that the conditions for performance testing shall be specified by the Administrator
M-5	129	EPA data were collected primarily from systems where a single furnace was controlled by the baghouse; it would be much more difficult to comply with the standard for systems ducting more than one furnace to a single control device. The present level of the standard (0.022 gr/dscf) will probably preclude the use of the latter control system	All the tests to support the standard were conducted under "normal" operation of the control device except for the tests of facility F, which was operating one furnace rather than the normal three of five furnaces ducted to the same control device. It is true that the test data used as a basis for the emission limits (A_1, B, and D) were collected with only one furnace in operation, however, this is "normal" for these plants At Plant A, only one furnace was ducted to the control device; at Plant B, a single large (100 ton) reverberatory furnace and two small (3/4 ton each) electric furnaces were ducted to the control device, but only the large furnace normally operates so it was tested by itself, at Plant D, two reverberatory furnaces were ducted to a single baghouse with seven filter compartments, but normal plant procedure when operating only one furnace was to use only four of the seven compartments and this was the arrangement during the test. The economic analysis assumed a single furnace/control device system and showed no unduly adverse economic impact on the industry. The multiple furnace/single control device system was mentioned only as a possible alternative, no evaluation as to the feasibility, either economically or technologically, was made.
M-6	204	What is the basis for exempting small furnaces (less than 1,000 kg/heat or 250 kg/hour) from the standard?	Small furnaces are normally operated only intermittently to produce specialty alloys and have lower emissions during production than do the larger furnaces Emissions are not significant, and a baghouse is not economically justifiable on the basis of the data
M-7	129	The tonnage figures shown in the test data summaries are not comparable, some are based on charge material while others are based on metal produced	True. These data were presented for information only and were not a part of the basis for the emission limitation
M-8	129	The test data on facility H show a variation of from 4100 scfm to 8000 scfm. The preliminary facility description states that two furnaces were in operation during the test. This fact is questioned based on such wide variations of the emission rates; perhaps only one furnace was in operation during part of the testing.	Two furnaces were in operation The control system consisted of 3 baghouses one venting the flue gases from both furnaces, one venting the charging door hoods, and one venting other emission points The six test results represent two runs on each of the three baghouse stacks The variations are from the different baghouses
M-9	129	The cost of achieving a collection efficiency in excess of 99 percent, which is required to meet the proposed emission level, is not justified.	No supporting data accompanied this comment. EPA analysis shows that the cost of achieving the emission level is not sufficient to result in an unduly adverse economic impact upon the industry
M-10	129	The investment costs presented in the background document are low, possibly due to the omission of costs for flues, ducts, and installation	The investment costs presented did include these costs, but the data were collected before 1971. It is possible that the costs today could be 10 to 15 percent higher due to general inflation
M-11	197	Cadmium may be emitted from these plants and the test method may not measure it. Cadmium emissions should be controlled because inhaling cadmium can lead to ill health.	The proposed standard is not intended to control cadmium emissions. The effects of cadmium on health and methods for controlling cadmium emissions are currently being studied by EPA

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
M-12	129	The NSPS requires that testing be conducted in an undiluted gas stream or that the amount of dilution be determined by the source This is not justified for the following reasons: (1) EPA tests were conducted in diluted gas streams with no attempt to correct results for such dilution, (2) dilution is necessary to cool the furnace gases to safe operating temperatures prior to the baghouse, (3) determining the amount of dilution would be extremely difficult and expensive since there are many points in the process where the air induced might be considered a diluent, (4) from the EPA data presented, it can be shown that the amount of dilution air used to cool the furnace gases will vary widely as a result of operator preference The concentration standard proposed (0 022 gr/dscf) will encourage the use of more dilution, a standard of 0.05 gr/dscf would allow the source to use less dilution air and consequently might result in less mass emission of particulates	The intent of requiring that tests for compliance with the standard be based on measurements of undiluted gases was to show that dilution could not be used for the purpose of complying with the standard Since such a prohibition applies to all standards, this point is made in an addition to subpart A, General Provisions, which applies to all standards. Another recent change to the General Provisions also makes it clear that the conditions for performance testing shall be specified by the Administrator, and the use of air to dilute for the purpose of compliance will be disallowed in such specifications. See the discussion of dilution air in Chapter 2, General Considerations
		Subpart N Iron and Steel Plants	
N-1	197, 150, 43	The visible emission standard should apply to the rooftop or secondary emissions as well as to primary emissions	Secondary emissions result during tapping, charging, and hot metal transfer operations Technology for control of these emissions was neither observed nor known to exist at any BOPF shop in the world, and an engineering assessment determined that the development of an emission standard was not technically feasible.
N-2	212	In order to comply with the proposed visible emission standard of less than 10 percent opacity, the control equipment would have to be designed to achieve emission concentrations considerably lower than the limit proposed (0 022 gr/dscf)	See the discussion of opacity standards in Chapters 2 and 8 of this document (Volume 3).
N-3	197, 212	The visible emission standard should be changed for the following reasons (1) the opacity limitation is too lenient It should specify a zero percent limit, and (2) the background document does not demonstrate that the 10 percent opacity limit is achievable, nor does it take into account the economic or environmental impact of the opacity limit as opposed to the concentration limit	See the discussion of opacity standards in Chapters 2 and 8 of this document (Volume 3).

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
N-4	43	The concentration standard set for particulate matter emissions is liberal in comparison to the Allegheny County regulation.	The form of the Allegheny County regulation does not support direct comparison with the new source performance standard. Allegheny County's regulation is a mass emission limitation applicable to many types of industrial sources, and it is based on a formula dependent upon empirical relationships developed locally. The emission limitation varies with charging rates. This approach to regulating emissions has considerable merit and can be applied well to defined local conditions. It is not practical to apply on a national scale to new sources.
N-5	212	The standard should be more explicit in its definition of dilution air. As presently worded, it is not clear whether or not combustion air is considered to be dilution air.	The intent of requiring that tests for compliance with the standard be based on measurements of undiluted gases was to show that dilution could not be used for the purpose of complying with the standard. Since this prohibition applies to all standards, this point is made in a change to subpart A, General Provisions, which applies to all standards. In addition, another recent change to the General Provisions makes it clear that the conditions for performance testing shall be specified by the Administrator, and the use of air to dilute for the purpose of compliance will be disallowed in such specifications. See the discussion of dilution air in Chapter 2, General Considerations
N-6	193	Wording of the standard does not limit applicability only to emissions from the control device.	The standard is intended to apply only to emissions from the control device The test method requires that emissions be sampled in either a stack or a duct. The outlet of the control device is the only logical location at which to sample.
		Subpart O Sewage Treatment Plants	
O-1	155	All tests should have been conducted while the units were operating at full capacity because reduced quantities of gas passing through the scrubber affect collection efficiency Low feed rates make results from Plants B, C, and E questionable.	Low sludge feed rates in multiple-hearth incinerators do result in decreased gas flow rate through the scrubber. Impingement scrubber efficiency would be reduced under these conditions, but a venturi scrubber can be designed with an adjustable throat that maintains collection efficiency through a wide range of gas flow rates Reduced scrubber efficiency does not, however, mean that emissions must increase at lower sludge burning rates. For example, for the three plants with impingement scrubbers (Plants B, C, and D) and the one plant with a cyclonic scrubber (Plant E), emissions in lb/ton of dry sludge varied not with percent of design feed rate but rather with amount of pressure drop A designer of multiple-hearth units suggested that the effect of decreased gas flow through the scrubber is compensated for by reduced turbulence in the incinerator, which results in less fly-ash entrainment and lower inlet grain loading
O-2	178	Test results show decomposition of chlorine-containing compounds in sludge during incineration This is not discussed in the background report on environmental impact.	At the facilities tested, chlorine emissions (as HCl) were minor For example, effluent gases at one of the facilities tested (Plant A) contained less than 10 ppm Cl. This amounts to less than 0 055 pound of chlorine per hour and will have little, if any, effect on the environment.
O-3	192	Impact of standard on ambient air quality is not discussed.	It is not practical or meaningful to make general determinations of changes in ambient air quality that might be caused by new or modified sources EPA does not know where such sources will be built, and many specific factors, such as topography, meteorological conditions, proximity of other pollution sources, and quantities emitted from all sources, will have great impact on air quality in specific locations
O-4	192	Technology is not really demonstrated to be available	One plant tested (Plant A), a typical facility except for the more effective scrubber, easily met the new source performance standard.
O-5	192	It seems remarkable to note that the annual cost per person is 50 percent more where an incinerator must meet the new source performance standard instead of "typical local standard." Telling us that the proposed new standard costs $0.04 per year more per person without stating that this is 50 percent more is hardly "truth in advertising "	As EPA data show, the cost of meeting the local standard is 8 cents per person per year and the cost of meeting EPA's standard is 12 cents per person per year. True, the additional 4 cents is a cost increase of 50 percent, but the actual amount remains insignificant Percent figures are often misleading In this case, expressing the increase in terms of 4 cents per person per year portrays the economic impact of the standard more clearly than does a percentage.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no	Commentator no.	Comment	Response
0-6	155	Cost figures do not take into account (1) additional space required for a venturi scrubber, and (2) addition of an aftercooler.	Venturi scrubbers, normally installed vertically, require no additional floor space; floor space required by the extra pumps is not considered significant. An aftercooler is not considered necessary to meet the standard.
0-7	197	The standard should also regulate particulate emissions from scum-burning and ash-handling activities.	It was not considered necessary to specify that the standard applied to scum burning. Scum is usually incinerated along with sludge because it has a higher Btu content than sludge. Incineration of scum actually decreases the auxiliary fuel required per pound of material fed to the incinerator. At the well-controlled plants visited, ash-handling activities did not generate any visible particulate emissions.
0-8	197	It is not clear from the definition of sewage whether or not the standard is applicable to sludge incinerators in industrial sewage treatment plants	The regulations have been revised to clarify that only municipal sewage sludge incinerators are affected by the standard
0-9	204	An odor regulation is needed in addition to the particulate emission regulation. Multiple-hearth and some fluidized-bed incinerators emit odors because exhaust gases are not adequately exposed to high temperatures	EPA assessed odors at both multiple-hearth and fluidized-bed incinerators. The absence of any odor problems indicates that the exhaust gases are adequately exposed to high temperatures.
0-10	252	Data in the January 1973 EPA Task Force Report on sewage sludge incinerators show that even well-controlled incinerators cannot meet the proposed standard.	The Task Force Report contained preliminary test results, some of which changed as calculations were checked. The corrected results, which were published in Volume 2 of this document show that sewage sludge incinerators can meet the standard.
0-11	178	The regulations include combustion air as dilution air. Treatment of EPA data in the background documents makes it obvious that EPA did not intend this. The regulations should be revised to allow combustion air to be added to the incinerator.	The regulations have been revised to (1) express the standard in pounds particulate per ton of dry sludge fed to the incinerator, and (2) delete the requirements concerning dilution air. This permits combustion air or dilution air to be added without invalidating the test because the test results in pounds per ton sludge are not affected by dilution
0-12	113	The concentration standard needs a reference basis such as a correction to 12 percent CO_2.	Agree, because the amounts of combustion air and cooling air admitted to the system vary from plant to plant. EPA considered using CO_2 content as a reference basis, but the scrubbers used to control particulate also absorb some of the CO_2. Mass emission units of pounds particulate per ton dry sludge were finally selected as the best approach to establishing a common reference basis because dilution of the exhaust gas does not affect actual mass emissions.
0-13	155	Is EPA saying that only venturi scrubbers can meet the standard?	No, but venturi scrubbers seem to be the most economical choice. Impingement scrubbers tested by EPA did not meet the standard but, in our best judgment, would do so if used in conjunction with an oxygen meter that automatically regulates fuel burning rate. In our best judgment, electrostatic precipitators could also provide more than adequate control. There are no EPA test data or either of these control systems because during the test program there were no existing plants using them.
0-14	155	EPA states on page 60 of the background document that control equipment manufacturers will guarantee 0.03 grain per dry standard cubic foot. What are the manufacturers' names?	EPA has removed this statement from the background document. Some manufacturers stated to EPA that their systems could meet the standard, but have provided no specific, written guarantees. Because one of the incinerators tested by EPA meets the standard, lack of guarantees does not imply inability to meet the standard.
0-15	155	How does the Massachusetts regulation (0.05 grain per dry standard cubic foot at 12 percent CO_2) compare to EPA's regulation (0.031 grain per dry standard cubic foot)?	EPA took CO_2 data from all incinerators tested, but found that the percentage of CO_2 varied from plant to plant and from test to test. This variation, sometimes significant, precludes any direct comparison of the two standards.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
		Test Methods	
TM-1	94, 204	Delete use of "alternative test methods."	Commentators have misinterpreted the intent of allowing alternative methods. The misinterpretation is due in part to the wording in the Preamble to the proposed Group II standards, where two examples of alternative methods were given. These examples imply that a wide range of alternatives is possible with use of suitable correction factors. In actuality, correction factors may be difficult to obtain without inordinate amounts of testing. The intent of allowing alternative methods was to reduce the complexity and cost of source testing where such reductions would not significantly increase the chances of violating the standard. Determination of the acceptability of a proposed alternative method would be made by the Administrator after an intensive review of the proposed method, the source, the control system, the operator, and comparative data.
TM-2	143, 176, 182, 222	The regulations for individual affected facilities should specify that the use of alternative or equivalent test methods is allowed.	Agreed. The appropriate section of each subpart has been revised to indicate that equivalent or alternative methods are allowed.
TM-3	221	The General Provisions concerning performance tests should be changed to: (1) include industry-accepted test methods as equivalent, (2) revise the wording associated with alternative method from "adequate for indicating" to "reasonably indicate," and (3) require EPA to publish alternative test methods in the Federal Register.	(1) Industry-accepted methods should not be accepted without due evaluation by EPA. A source may use equipment or procedures that have been found to yield invalid results; some mechanism for checking these procedures must be available. (2) The word change does not seem to alter the meaning or intent of the proposed regulation. (3) This procedure has been considered by EPA. However, a multiplicity of alternative methods may be proposed, and publishing of all may well prove too voluminous to be reasonable. Instead, EPA now plans to publish on a periodic basis in the FEDERAL REGISTER a list of sources for which alternative methods have been approved. Further information could then be obtained upon request. No specific references to these procedures are deemed necessary in the regulations.
TM-4	125	Iodine number flasks should not be used because sampling errors are greater than with plain flasks.	The term "iodine number flask" is confusing; nomenclature has been changed to "iodine flask" for clarity.
TM-5	251	Normal cubic meter generally refers to a cubic meter at 0°C and 760 mm Hg, but EPA has defined normal conditions as 21.1°C and 760 mm Hg.	"Normal cubic meter" has been changed to "dry cubic meter at standard conditions" (dscm), with standard conditions defined as 20°C and 760 mm Hg.
TM-6	250	The definition of particulate matter implies a return to the entire train; i.e., front half and back half, for these regulations.	This was not the intent, and EPA feels that we did not so imply.
TM-7	239	When a specific test method is cited, reference to its location in the FEDERAL REGISTER should be included.	Referencing one specific FEDERAL REGISTER publication would not be prudent. Test methods quite often undergo changes for clarification and simplification, and reference to any specific version would hamper adoption of new or better procedures.
TM-8	174, 234	Typographical and other errors in Methods 10 and 11.	Corrected.
TM-9	129	Dilution air should be allowed.	The intent of requiring that tests for compliance with the standard be based on measurements of undiluted gases was to show that dilution could not be used for the purpose of complying with the standard. Since such a prohibition applies to all

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
			standards, this point is made in a change to subpart A, General Provisions, which applies to all standards. In addition, another recent change to the General Provisions makes it clear that the conditions for performance testing shall be specified by the Administrator; the use of air to dilute for the purpose of compliance will be disallowed in such specifications.
TM-10	133	Minimum training should be required for test personnel.	The comment has merit but would be very difficult to implement. Sampling capability is greatly dependent upon experience, much less so on education. Further, published procedures are very detailed, so that operator judgment is held to a minimum. Finally, a test team will typically consist of at least a leader and an operator, with larger tests requiring proportionately larger teams, the more people involved, the less the inexperience of one person will affect the results. This is in contrast, for example, with an opacity reader who typically works alone and therefore is required to update his skills periodically.
TM-11	255	Permissible isokinetic variation should be ± 20 percent.	This recommendation is based on theoretical work by the commentator. This approach was initially used (36 FR 15704) and then changed (36 FR 24876) to the present method. The original method was based on attempts to ensure concentration results within ± 10 percent. However, evaluation of data from hundreds of tests showed that ± 10 percent isokinetic can be maintained virtually all of the time. Concentration results are thus within ± 5 percent. The comment was made after evaluation of EPA data indicated that the EPA requirement of ± 10 percent isokinetic had not been met in some instances. Recalculation of those specific test results showed that the original reports were in error and that ± 10 percent had in fact been achieved.
TM-12	163	Method 10: (1) Illustrations and descriptions of sampling devices and trains are inadequate. (2) Use of the grab-sampling train is not clear. (3) Purging provisions are inadequate. (4) The sampling train can be dangerous if the sample inlet line is blocked during calibration. (5) Orsat analysis could be eliminated by using solid absorbers for H_2O and CO_2 determination.	(1) The descriptions are believed to be adequate by EPA engineers. (2) The term "grab sampling" is misleading. It has been changed to "continuous sampling." (3) The purging requirements are the same as those defined in method 3 and have been used successfully for many years. (4) Agreed, but the possibility of this happening is very remote. (5) This procedure was initially proposed and used but was later changed because it was believed accuracy might be poor at low concentrations of water and CO_2. Further consideration of the entire procedure resulted in the conclusion that the solid absorbers should be included as alternatives to Orsat analysis, and the regulation has been revised accordingly.
TM-13	125, 247	Method 10 is not specific enough as to when initial zero and span checks should be made.	The test method specifies that these operations are to be performed both before and after the test.
TM-14	148	Method 10 (1) Much better performance specifications are attainable with his equipment, and (2) the H_2O and CO_2 traps could be eliminated with such equipment.	Item (1) of the comment is probably true, however, the purpose of defining performance specifications is not to reflect best available instrumentation, but rather to establish minimum acceptable performance criteria. Item (2) is probably not true at the observed stack concentrations.
TM-15	197	For method 10, calibration gases should be chemically calibrated.	EPA considers the chemical methods recommended to be less accurate than those employed by the manufacturers. Calibration certification by the manufacturer is now specified in the regulation.
TM-16	166	The sample time specified in subpart J, Petroleum Refineries, does not agree with that given in method 11.	True. Subpart J has been changed to be consistent with method 11.

APPENDIX E (continued). SUMMARY OF COMMENTS AND RESPONSES PERTINENT TO NEW SOURCE PERFORMANCE STANDARDS (40 CFR 60) PROPOSED IN FEDERAL REGISTER OF JUNE 11, 1973 (38 FR 15406)

Comment no.	Commentator no.	Comment	Response
TM-17	163	Method 11: (1) The midget sampling train is not efficient. (2) Universal Oil Products (UOP) method 212-72 should be used instead of method 11.	(1) EPA has performed tests to evaluate collection efficiency, and 100 percent efficiency was obtained in tests using about 500 ppm H_2S (2) An evaluation of the proposed method indicates that it may well be acceptable, although it may be more cumbersome and difficult to use than method 11. The commentator has the option of submitting his method to EPA as an equivalent or alternative method.
TM-18	212, 247	Recommend use of Inter-society Committee (IC) Method 701 in place of method 11 because with method 11 the sampling time is too long and interference can bias the results	The IC method may well be equivalent and may be approved as such upon presentation of data. However, method 11 was used for the EPA tests and it must continue to be the reference method, or all tests will have to be repeated. EPA evaluations indicate that SO_2 is the only major potential interferent at this source. Therefore, method 11 was modified by adding a fifth impinger to remove any SO_2. The effect of this change was verified in a series of laboratory tests.
TM-19	143, 166, 176, 182	Monitoring instruments do not need zero adjustment and calibration every 24 hours, as required for emission monitoring in subpart J, Petroleum Refineries. The regulation should instead require that these operations be performed only as often as necessary or that the instrument be kept in proper operating condition to meet allowable tolerances	This requirement may not be strictly applicable or necessary for all instruments. However, assurance is needed that zero and calibration are being maintained on at least a daily basis The procedures for this vary with the type of instrument involved In some cases zero and calibration may be automatic or may be inherent in the instrument, in some cases, zero and calibration can be performed manually with minimal effort, and in some cases zero and calibration checks are more difficult To date, EPA has not evaluated or utilized instruments in this application, and we are therefore not able to provide a more definitive calibration specification, or to provide for any exceptions A program is currently being undertaken to obtain needed information On the basis of this, further guidance or a revision in the zero and calibration requirement will be provided

APPENDIX F. ERRATA FOR

BACKGROUND INFORMATION FOR PROPOSED

NEW SOURCE PERFORMANCE STANDARDS:

VOLUME 1, MAIN TEXT (APTD-1352a)

Page no.	Paragraph no.[a]	Line no.	Correction
			INTRODUCTION
2	3	7	Last word of line should be "no" instead of "not"
4	Table 1	-	The first number in the second column (Allowable emission rate) should be "0.30" instead of "0.03"
5	2	2	Change "all" to "these"
5	3	4	Change "all" to "these"
			ASPHALT CONCRETE PLANTS
9	3	2	The number "0.03" should be "0.031"
9	Figure 1	-	Caption should read: "Partially controlled hot-mix asphalt concrete plant."
9	Figure 1	1	The label "HOT SCREENS" should be "HOT AGGREGATE SCREENS"
10	2	1-3	Delete the first sentence and replace it with the following: "The proposed standard requires that emissions from a plant with only a cyclone dust collector be reduced by about 99.7 percent. The proposed standard can be met by using fabric filters or medium-energy venturi scrubbers, normally preceded by a cyclone or multiple cyclone, to collect dust from the dryer (Figure 2)."
10	Figure 2	-	The label "HOT SCREENS" should be "HOT AGGREGATE SCREENS"
10	Figure 2	-	The duct leading from PRIMARY DUST COLLECTOR TO BAGHOUSE should not have a duct leading from it to MINERAL FILLER FINES STORAGE

[a]A partial paragraph beginning a page is designated paragraph no. 1.

Page no.	Paragraph no	Line no.	Correction
10	4	1	Change "(0.031 dscf)" to "(0.031 gr/dscf)"
11	1	3	Change "Eight" to "Seven"
11	1	4	Add the following as the last sentence of the paragraph: "One plant scheduled for testing closed for the winter before the arrival of the EPA test crew."
11	2	2	Change "Nine" to "Eight"
11	3	1	Delete the parenthetical material: "(three samples per test)"
12	4	7	Change reference number from "5" to "4"
12	5	2	The number "0.030" should be "0.020"
12	6	3-5	Delete lines 3-5 ("The replacement... change in fuels.")
12	8	7	Change reference numbers from "1, 5-9" to "1, 6, 8, 9, 10"
12	8	9	Change "such" to "so"
12	8	10	Change line to read: "from baghouses are nearly the same over the wide variety of aggregate feedstocks typically used by asphalt concrete plants.[5, 8-13] This is further"
13	1	6	Change "...aggregate was used..." to "...aggregate fines were used..."
13	1	7	Delete the phrase "of only 4.5:1." and insert in its place the following: "of more than 50 times less than the proposed standard."
13	3	3	Change "collection, maintenance, and operation" to "collector maintenance and operation"
13	3	4	Change "...require installation and proper maintenance..." to "...require proper installation, operation, and maintenance..."
13	5	1	Change "10" to "about 6.6"
13	5	2	Change the period after "years to a comma and insert the following: "and new plants have been installed at the rate of 250 to 260 per year.[16]"

Page no.	Paragraph no.	Line no.	Correction
13	5	3	Change "increase" to "increased"
13	5	6	Insert reference number "16" at end of paragraph.
14	2	3	Delete the phrase "for either size plant" and insert in its place "for a given size plant"
14	5	2	Change "...new plant should..." to "...new plants should..."
15	-	-	Insert reference 16 as follows: "16. A Systems Analysis of the Production and Laydown of Hot Mix Asphalt Pavement. Texas Engineering Experimental Station, Texas A&M University, College Station, Texas. 1970 study funded by NAPA. p. 41."
15-16	-	-	Change reference numbers 16 through 22 to reference numbers 17 through 23.
		PETROLEUM REFINERIES, FLUID CATALYTIC CRACKING UNITS	
19	5	1	Change "three" to "four"
19	5	3	Change "average" to "averaged"
19	5	3	Change "three" to "two"
21	2	1	Change "three" to "four"
		PETROLEUM REFINERIES, BURNING OF GASEOUS FUELS	
25	1	4	Insert a period after "releases" and delete "or to the burning of liquid or solid fuels in the same heaters and boilers."
26	3	3	The number "13" should be "10"
27	1	6	The number "13" should be "10"
27	3	7-8	Insert a period after "disposal" and delete "by incineration or landfill."
28	1	4	Change "discernable" to "discernible"
28	1	5	The number "13" should be "10"
		STORAGE VESSELS FOR PETROLEUM LIQUIDS	
		No corrections	

Page no.	Paragraph no.	Line no.	Correction
			SECONDARY LEAD SMELTERS AND REFINERIES
			No corrections
			SECONDARY BRASS OR BRONZE INGOT PRODUCTION PLANTS
45	1	3	After "...(cupola) furnaces." insert the following two sentences: "Figure 21 shows two types (stationary and rotary) of reverberatory furnaces operating at the same plant since this arrangement is typical in medium-to-large plants; the stationary type can be designed to produce much larger batches of metal, but the rotary type is more economical when the demand is for smaller quantities of a particular alloy of brass or bronze. Blast furnaces (cupolas) are normally found only at the larger plants where it becomes practical to recover metal from the slag of the reverberatory furnaces; electric furnaces are alternatives to rotary-type reverberatory furnaces."
45	2	2	Change "blast" to "reverberatory"
45	2	3	Change "reverberatory" to "blast"
45	2	3	Change "less" to "more"
45	5	1	Delete parenthetical material: "(Figure 21)"
45	5	8	Change "Emissions from electric furnaces are..." to "The composition of emissions from electric furnaces is..."
45	5	9	Delete the words "process and"
45	6	2	Change "...scrubber has..." to "... scrubber or electrostatic precipitator has..."
45	6	4	Change "scrubbing" to "this control"
46	Figure 21	-	The label "REVERBATORY FURNACE" should be "STATIONARY FURNACE"
46	Figure 21	-	The caption should read: "Controlled secondary brass and bronze reverberatory furnaces."
46	4	4	Change "plant" to "control equipment"

Page no.	Paragraph no.	Line no.	Correction
46	6	1	Change "...at each plant. The tests..." to "...at each plant where the tests..."
47	1	3	Change "tests" to "individual sample results"
47	2	2	Delete the number "0.0125" and insert in its place the numbers "0.012, 0.013," so that the line reads: "0.002, 0.005, 0.010, 0.012, 0.013, 0.014, and 0.017 gr/dscf..."
47	3	2-3	Delete last sentence of paragraph ("No visible...by EPA.") and replace it with the following: "Plants E and F, which were previously tested by EPA, were observed to have no visible emissions."
47	4	1	Between "gr/dscf" and semicolon, insert the following phrase: "using test code method 4"
47	4	4	Delete "is similar." and insert "and composition of emissions are similar, and the uncontrolled emission rate is less from an equivalent-size electric furnace. During an EPA inspection of an electric furnace facility, the facility was operating with no visible emissions."
		IRON AND STEEL PLANTS	
50	8	1	Delete "that are specifically for" and replace with "applicable to"
50	8	2	Delete "0.1 to 0.2...0.090 gr/scf" and replace with "0.01 to 0.09 gr/scf."
50	8	3	Change "77" to "17"
50	8	4	Change "Section" to "section"
		SEWAGE TREATMENT PLANTS	
57	1	3	Insert "municipal" between "all" and "sewage"
59	2	3	Change "previsous" to "previous"

APPENDIX G. ERRATA FOR

BACKGROUND INFORMATION FOR PROPOSED

NEW SOURCE PERFORMANCE STANDARDS:

VOLUME 2, APPENDIX: SUMMARIES OF TEST DATA (APTD-1352b)

Page No. — Correction

HOT MIX ASPHALT CONCRETE PLANTS

Change indicated numbers in tables as follows:

7 Table A-1. ASPHALT CONCRETE FACILITY A_1

Run number	1	2	3	Average
	*	*	*	
Stack Effluent				
Flowrate, dscfm	17,333	17,122	17,548	17,344
Flowrate, dscf/ton product	9,285.5	11,543	10,743.6	10,432
	*	*	*	
Particulate emissions				
Probe and filter catch				
	*	*	*	
lb/hr	0.85	1.11	1.01	0.99
lb/ton of product	0.0135	0.018	0.016	0.016
Total catch				
	*	*	*	
lb/hr	4.05	2.78	2.76	3.21
lb/ton of product	0.065	0.044	0.044	0.051
	*	*	*	

9 Table A-3. ASPHALT CONCRETE FACILITY B

Run number	1	2	3	Average
	*	*	*	
Stack effluent				
Flowrate, dscfm	22,375	22,392	23,907	22,891
Flowrate, dscf/ton product	6,613	6,785	6,078	6,469
	*	*	*	
Particulate emissions				
Probe and filter catch				
	*	*	*	

Page No.	Correction				
9 (continued)	lb/hr	1.53	1.92	1.32	1.59
	lb/ton of product	0.007	0.01	0.006	0.007
	Total catch				
		*	*	*	
	lb/hr	19.31	10.54	3.42	11.09
	lb/ton of product	0.095	0.053	0.014	0.052
		*	*	*	
11	Table A-5. ASPHALT CONCRETE FACILITY D				
	Run number	1	2	Average	
		*	*	*	
	Stack effluent				
	Flowrate, dscfm	25,213	25,361	25,287	
	Flowrate, dscf/ton product	6,845	6,503	6,465	
		*	*	*	
	Particulate emissions				
	Probe and filter catch				
		*	*	*	
	lb/hr	2.61	4.88	3.75	
	lb/ton of product	0.012	0.021	0.016	
	Total catch				
		*	*	*	
	lb/hr	11.1	27.84	19.4	
	lb/ton of product	0.05	0.119	0.085	
		*	*	*	
15	Table A-9. ASPHALT CONCRETE FACILITY H_1				
	Run number	1	2	3	Average
		*	*	*	
	Stack effluent				
	Flowrate, dscfm	30,002	29,887	27,969	29,286
	Flowrate, dscf/ton product	10,228	9,291	9,871	9,762
		*	*	*	
	Particulate emissions				
	Probe and filter catch				
		*	*	*	

Page No.	Correction				
15 (continued)	lb/hr	7.98	8.70	6.99	7.89
	lb/ton of product	0.045	0.045	0.041	0.044
	Total catch				
		*	*	*	
	lb/hr	12.75	27.79	13.29	17.94
	lb/ton of product	0.072	0.144	0.078	0.100
		*	*	*	

PETROLEUM REFINERIES
FLUID CATALYTIC CRACKING UNITS

23 Facility C: Delete last sentence ("During ...unit.") and replace it with the following: "The electrostatic precipitator consisted of two identical parallel precipitators vented to separate stacks. During the test, a malfunction occurred in one precipitator, invalidating the particulate test results obtained on stack B. Data analyses are thus based on particulate test results obtained on stack A."

23 Facility D: On line 5 after "occurred" and before the comma, insert the phrase "in the carbon monoxide boiler"

28 Table A-19: Delete reference to footnote b on "Particulate emissions" and add reference to footnote b to the particulate emission numbers listed under stack B. That section of the table then reads as follows:

Particulate emissions								
Probe and filter catch								
gr/dscf	0.0380	0.1066[b]	0.0369	0.0589[b]	0.0352	0.0450[b]	0.0367	0.0702[b]
gr/acf	0.0182	0.0499[b]	0.0167	0.0282[b]	0.0169	0.0213[b]	0.0173	0.0331[b]
lb/hr	29.7	85.5[b]	27.8	49.0[b]	27.4	36.5[b]	28.3	57.0[b]
Total catch								
gr/dscf	0.2366	0.2092[b]	0.2159	0.1776[b]	0.2088	0.1775[b]	0.2204	0.1881[b]
gr/acf	0.1136	0.0979[b]	0.0978	0.0851[b]	0.1006	0.0840[b]	0.1040	0.0890[b]
lb/hr	184.8	167.8[b]	162.5	148.0[b]	162.7	143.8[b]	170.0	153.2[b]

28 Footnote b: Add the phrase "for stack B." to the end of the footnote.

29 Table A-20: Add footnote reference to title as follows: "CATALYTIC CRACKING FACILITY D, SUMMARY OF RESULTS[a]"

29 Add footnote below table as follows: "[a]Malfunction of test equipment invalidated particulate test results."

SECONDARY LEAD SMELTERS AND REFINERIES,
BLAST AND REVERBERATORY FURNACES

33 Table A-22: The numbers in the category "Visible emissions, % opacity" for run number 2 should be "10 to 20" instead of "10 to 70"

Page No.	Correction
	SECONDARY BRASS AND BRONZE REFINING
42	Facility B: Add the following sentence to the end of the description: "Baghouse also controls emissions from two small (1500 lb) electric furnaces, but they are not normally used and were not used during the tests."
42	Facility D: Add the following sentences to the end of the description: "Two furnaces are ducted to the baghouse, but only one was in operation during the test. Only four of the seven baghouse compartments are normally used when a single furnace is operating and this procedure was followed during the tests."
43	Facility E: Add the following sentence to the end of the description: "Baghouse also controls emissions from two other gas-fired 100-ton reverberatory furnaces that were not operating during the tests."
43	Facility F: Add the following sentences to the end of the description: "Baghouse also controls emissions from four other rotary furnaces that were not operating during the tests. Typically, three of the five furnaces operate at once."
43	Facility I: Add the following sentence to the end of the description: "Baghouse also controls emissions from three other rotary furnaces that were not operating during the tests."
44, 46	Tables A-31 and A-33: The numerical entries for the side heading "Visible emissions, % opacity" should be 0 instead of <10.
46, 47, 48	Tables A-33, A-34, and A-35: Delete the side heading "Excess air at sampling point, %" and its numerical entries.
48	Table A-35: The numerical entries for the side heading "Emissions, % opacity" should be 0 instead of <10 for runs 2 and 3.
49	In footnote a, "analysed" should be changed to "analyzed"
51	Table A-38: Add to the end of the table title a superscript "a"; then add footnote a at the bottom of the table as follows: "[a] Tested using Code Method 4."
	IRON AND STEEL MILLS
	No corrections
	SEWAGE TREATMENT PLANTS
	No corrections

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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15 SUPPLEMENTARY NOTES

16 ABSTRACT

This volume is the third in a series on standards of performance for asphalt concrete plants, petroleum refineries, storage vessels for petroleum liquids, secondary lead smelters, brass and bronze ingot production plants, iron and steel plants, and sewage treatment plants. The first two volumes gave background information and the data base for the proposed standards. This volume presents the promulgated standards and the rationale for any changes that were made, with particular attention to the problems of opacity and dilution air. Major comments received during the period for public comment are discussed where appropriate and are summarized with Agency responses in the appendix. The appendix also contains a list of commentators, new data for asphalt concrete plants, revised economic analyses for asphalt concrete plants and petroleum refineries, and errata for Volumes 1 and 2.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air pollution Pollution control Performance standards Asphalt concrete plants Petroleum refineries Lead smelters and refineries	Brass ingot production Bronze ingot production Steel production Sewage treatment	Air pollution control	

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