ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Part 60]

[FRL 273-4]

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES

Modification, Notification, and Reconstruction

Notice is hereby given that pursuant to the authority of section 111 of the Clean Air Act, as amended, the Environmental Protection Agency is proposing amendments to the general provisions of 40 CFR Part 60, originally published on December 23, 1971 (36 FR 24876) and amended October 15, 1973 (38 FR 28564) and March 8, 1974 (39 FR 9308). The amendments proposed herein include revisions and additions to clarify the definition of "modification" in the Act, to require notification of construction or potential modification, and to clarify application of standards of performance to reconstructed sources. The general provisions apply to all standards of performance for new and modified sources, both those standards promulgated to date (36 FR 24876 and 39 FR 9308) and those to be promulgated in the future.

BACKGROUND

Section 111 of the Act provides that the standards of performance established for new stationary sources reflect the degree of emission limitation attainable through the application of the best system of emission reduction which, considering cost, the Administrator determines has been adequately demonstrated. The Act further defines "new source" as "any stationary source, the construction or modification of which is commenced after the publication of regulations (or, if earlier, proposed regulations) prescribing a standard of performance under this section which will be applicable to such source." Thus, the standards apply not only to entirely new construction, but also to existing sources which undergo modification.

As defined in the Act, modification is "* * * any physical change in, or change in a method of operation of, a stationary source which increases the amount of any air pollutant emitted by such source or which results in the emission of any air pollutant not previously emitted." Supportive legislative history for section 111 of the Act allows considerable latitude in interpreting phrases in the definition of modification such as "stationary source" and "increases the amount of any air pollutant emitted." Various interpretations of these phrases can result in different degrees of impact on emissions from existing sources as these sources undergo physical and operational changes. The definition of "modification" under 40 CFR 60.2(h) (December 23, 1971) includes some provisions which exempt certain physical and operational changes from being modifications. Revisions and additions to 40 CFR 60.2 and the addition of § 60.14 are proposed herein to further clarify the definition of "modification" as it will be interpreted by the Agency in identifying modified sources and applying standards of performance to sources after they have been modified.

MODIFICATION

Although the term "modification" is defined in section 111(a)(4) of the Act as well as in 40 CFR 60.2(h) in the general provisions to this part, considerable confusion exists outside the Agency as to what "changes" can be made to an existing source without the Administrator considering the source to have been modified. As defined in the Act and in 40 CFR 60.2(h), the term "modification" includes several terms and phrases which are not fully understood outside the Agency. Therefore, several different interpretations could be derived from reading the definitions. For example, one interpretation could lead to the conclusion that an entire source would be considered modified by the addition of a new piece of equipment which increased the emissions from that source. However, under the interpretation used by the Administrator, only the new piece of equipment itself would become subject to the standards of performance contained in this part. The purpose of the amendments proposed herein is to resolve any confusion that may exist as to what constitutes a modification. The phrases and terms which have caused confusion are discussed in the following paragraphs, and examples are cited to show how the Agency intends to apply the term "modification" to physical or operational changes in a source.

The standards of performance as set forth in this part apply to "affected facilities" rather than to "stationary sources." The term "affected facility" is defined under existing 40 CFR 60.2(e) and is used because the standards apply to individual processes and pieces of equipment rather than to entire stationary sources which may consist of a combination of processes and pieces of equipment. The amendments proposed herein introduce a new term, "existing facility," to replace the term "affected facility" which appears in the existing definition of "modification" in 40 CFR 60.2(h). This proposed revision is intended to clarify rather than to change the intent of the definition of "modification" set forth in existing 40 CFR 60.2(h), which had replaced the term "stationary source" found in the Act's definition of modification with "affected facility." The meaning of "affected facility" as used in 40 CFR 60.2(h) was intended to include an apparatus to which a standard would apply if the apparatus undergoes modification. However, the definition of "affected facility" is limited to an apparatus to which a standard applies. Therefore, the proposed amendments introduce the term "existing facility" to replace the term "affected facility" in the definition of "modification" to refer to any apparatus of the type for which a standard of performance is promulgated in this part but the construction or modification of which was commenced before the date of proposal of that standard. Such an existing facility would become an affected facility if it is modified. Thus the proposed revision specifies that the term "modification" is applicable only to existing facilities. A new definition of "stationary source" is also proposed to clarify that a "stationary source" may consist of any combination of one or more affected facilities, existing facilities, and facilities to which standards do not apply.

The proposed amendments clarify that the construction of an affected facility at a stationary source does not constitute a modification of the stationary source and does not cause the entire stationary source to become subject to the standards of performance. As an example, the addition of a new basic oxygen process furnace to an existing furnace shop which includes two furnaces, would not make the entire steel mill or the two existing furnaces subject to standards of performance; only the new furnace would be subject to standards of performance. If one of the existing basic oxygen furnaces was enlarged such that the total emissions of particulate matter from all existing and affected facilities at the source increased, that furnace would become subject to the standard of performance.

The proposed amended definition of "modification" also includes a new phrase "* * * emitted into the atmosphere * * *." The new phrase clarifies that for an existing facility to undergo a modification there must be an increase in actual emissions. If any increase in emissions that would result from a physical or operational change to an existing facility can be offset by improving an existing control system or installing a new control system for that facility, such a change would not be considered a modification because there would be no increase in emissions to the atmosphere. The Administrator considered defining "modification" so that increases in precontrolled (potential) emissions would be considered modifications. However, the proposed definition of modification is limited to increases in actual emissions in keeping with the intent of section 111 of controlling facilities only when they constitute a new source of emission.

The regulations proposed herein address the subject of modifications in a new section (§ 60.14 *Modification*). The purpose of paragraphs (a) and (b) is to clarify the phrase in the definition of modification, "increases the amount of any air pollutant." Clarification of this phrase is necessary for determining whether a modification has occurred and for applying a standard to a facility once it has been modified. Section 60.14 specifies that once an existing facility is determined to be modified, standards of performance will be applied for only those pollutants for which there was an increase in emissions. Also, only pollutants for which standards of performance have been promulgated for the affected facility in question will be regulated. Therefore, if an affected facility is regulated by standards of performance for particulate matter, nitrogen oxides

HeinOnline -- 39 Fed. Reg. 36946 1974

and sulfur dioxide, and if emissions of ammonia and particulate matter from a corresponding existing facility increase as the result of a physical or operational change, standards of performance would be applied only to the particulate matter emissions from the modified facility. Section 60.14(a) also clarifies that once an existing facility has been modified, it is considered an affected facility and is subject to standards of performance in the same way as a newly constructed affected facility. Therefore, the entire affected facility is subject to the standards of performance, not just the portion of the affected facility which is responsible for the increase in emissions. For example, if an existing facility is modified by doubling its capacity, all of the emissions from the expanded facility are subject to the applicable standard of performance and not just the new emissions. Standards of performance are developed for an affected facility as an entity. These standards cannot be reasonably applied to fractions of an entity.

Section 60.14(b) as proposed herein clarifies what constitutes an increase in emissions and the methods for determining the increase. The unit of measurement proposed for determining whether an increase in emissions has occurred is kilograms per hour (kg/hr). Other alternatives considered included other units of time (day, year), concentration, feed rate into a process, and production rate. Units of time have the advantages of being sensitive to increased production capacity and to the overall increase in total emissions to the atmosphere. In addition, the units kg/hr automatically allow increases in operating hours as intended by one of the existing exemptions under 40 CFR 60.2(h), providing mass emissions per hour do not increase. By defining "increase in emissions" in terms of kg/hr, the proposed regulations could not be interpreted as considering an increase in opacity of emissions as a modification unless there is a corresponding increase in mass rate of pollutant emissions. Under certain conditions, an increase in opacity is not accompanied by an increase in mass emission rate.

As proposed, § 60.14(b) provides four mechanisms which the Administrator may use (but to which he is not limited) in determining whether an increase in emissions has occurred. These are emission factors, material balances, continuous monitoring systems, and manual emission tests. In the Act the phrase "increase in emissions" is not defined and therefore can be interpreted to mean "any increase in emissions." Emissions from a source can, however, fluctuate daily in response to routine physical and operational changes. When an estimating technique such as emission factors is used to determine if emissions have increased, these fluctuations are not important since these techniques utilize parameters such as maximum production rate, which do not reflect daily fluctuations, in calculating emission rates. However, measuring techniques such as emission tests or continuous monitors are sensitive to routine fluctuations in emissions, and thus a method is needed to distinguish between significant increases in emissions and routine fluctuations in emissions. During the preparation of these amendments, several alternative methods for making this distinction were considered, including statistical methods and an arbitrary cut-off point. A statistical method, the Student's t test, is proposed herein in Appendix C. However, there are advantages and disadvantages to each of the methods considered by the Agency, and the Administrator urges all interested parties to submit comments on the Student's t test, an arbitrary cut-off, or suggested other methods during the comment period to aid in preparation of the promulgated regulation.

According to the proposed regulation, each set of emission tests (using manual tests or continuous monitors) conducted before and after a physical or operational change would consist of at least three runs, and would be conducted under representative operating conditions. The Student's t test would be used to determine whether there is an increase in emissions. The advantage of the Student's t test is that it differentiates between significant and insignificant increases in emissions by considering insignificant increases as those which are not detectable due to the variation of the data. Whether or not an emission increase is detected by this test depends on two things: the difference in the means of the two tests and the degree of variability in each set of three runs. A disadvantage of the Student's t test is that it assumes a common variance before and after modification which may not be the case. Also, it is influenced by outliers, so that an inconsistently high or low value could increase the estimate of the variance making it highly unlikely that any difference would be detected.

Another method considered by the Agency, naming an arbitrary cut-off point in terms of a percentage increase in emissions, also differentiates between routine fluctuations and significant increases in emissions. Anything above, for example, a 10 percent increase would constitute a modification. Disadvantages of this approach are that the choice of a cut-off point would be completely arbitrary, and those sources with the largest emissions would have an unfair advantage. Also, there would be the problem of determining how much of a percentage increase over the arbitrary cut-off point would be acceptable. For example, if the cut-off point were 10 percent, and a physical or operational change caused a 10.4 percent increase in emissions, it would still be necessary to take into account variations in the test method.

As proposed, § 60.14(c) clarifies that the addition of an affected facility to a stationary source either as an expansion of that source or as a replacement for an existing facility does not by itself cause the remainder of the stationary source to be subject to standards of performance. It can be inferred from the definitions in the Act, for example, that if emissions increase as the result of the construction of a new basic oxygen furnace in an iron and steel mill, the entire iron and steel mill (or at least the affected facilities for which standards have been developed) would be subject to standards of performance. This interpretation has not been adopted because, in the judgment of the Administrator, the costs which would result from requiring all existing facilities in a stationary source to comply with standards of performance because of a change in one existing facility would in most cases be disproportionate to the capital investment required to originally make the physical or operational change.

As proposed, § 60.14(d) would allow an existing facility to undergo a physical or operational change which results in an increase in the emission rate into the atmosphere of any pollutant to which a standard applies, but not be deemed a modification, provided the owner or operator demonstrates to the Administrator's satisfaction that the total emission rate of any such pollutant from all existing and affected facilities at the stationary source has not increased. The Agency realizes that, in some cases, it may be more economical to control an existing or affected facility other than the one undergoing an alteration. In such cases no new sources of air pollution are created and the impact on the environment is the same as controlling the altered facility to the prechange level of emissions. However, when a new affected facility is constructed to add new capacity or replace old capacity, that new facility must be controlled to meet the standards of performance. This policy will require that best systems of control technology be included when planning and constructing sources of emissions, as was contemplated in the development of section 111.

It should be noted that there may be numerous methods of reducing the emissions of a specific pollutant from a variety of emission points within a plant, some of which would be difficult to quantify. In view of this the reduction of emissions must be accomplished by improving the collection capability of an existing control system, by adding a new control system, or by making physical or operational changes to existing and affected facilities within the source such that the source owner or operator can demonstrate by emission tests that there has been no net increase in emissions. Emission reductions would not be considered which result from compliance schedule requirements to meet other regulations. The emission rates established to compensate for the increase in emission rate caused by the physical or operational change become enforceable emission limitations, and any increase in emission rate in excess of those limitations will be considered a violation of the regulation.

In developing the provisions proposed under § 60.14(d), the Administrator considered allowing an existing facility to undergo a physical or operational change which results in an increase in the emis-

HeinOnline -- 39 Fed. Reg. 36947 1974

sion rate into the atmosphere of any pollutant to which a standard applies provided the total emission rate from all points of emission at the entire stationary source has not increased. This concept was not totally accepted and the proposed provisions limit consideration to include only emissions from existing and affected facilities. Points of emission other than existing and affected facilities were not included for the following reasons:

(1) Each standard of performance is based on a prescribed test procedure which takes into account the design and operating characteristics of the apparatus involved. These test procedures have been demonstrated to yield accurate and precise results. Facilities for which standards of performance have not been developed could have unique design or operating characteristics which could cause unforeseen and unaccounted for inaccuracies in test procedures which were not developed with a specific type of source in mind.

(2) The Agency plans, over the next few years, to promulgate standards of performance for all facilities which contribute significantly to air pollution; therefore, at that time, most facilities would be classified either as existing or affected facilities.

As proposed, § 60.14(e) sets forth operational or physical changes which will not be considered modifications even though the emission rate may increase. These exemptions are similar to the present exemptions expressed in the definition of modification under 40 CFR 60.2(h); however, some differences should be noted. The exemption of increases in production rate is no longer dependent upon the "operating design capacity." This term is not easily defined, and for certain industries the "design capacity" bears little relationship to the actual operating capacity of the facility. The proposed exemption implicitly defines "design operating capacity" as that production rate which can be accomplished without making major capital expenditures on the stationary source containing the existing facility. A definition of the term "capital expenditure" is proposed to mean an expenditure for long-term additions or improvements which are chargeable to a capital assets account. The exemption of the use of an alternative fuel or raw material if provi- clarified to indicate that an existing facility is "designed to accommodate" an alternative fuel or raw material if provsions for that use were included in the final construction specifications. Conversions to coal required for energy considerations as stipulated in section 119 (d) (5) of the Clean Air Act, as amended, are specifically exempted. The exemption concerning the addition of a control system proposed under § 60.14(e) (5) is new and would exempt changes such as the addition of an afterburner to a control system to reduce odor even though particulate emissions may increase due to the afterburner.

NOTIFICATION

As provided under 40 CFR 60.7, source owners and operators are required to notify the Administrator prior to the startup of an affected facility. Under the authority of section 114 of the Act, revisions to this requirement are being proposed herein to require source owners or operators to also notify the Administrator within 30 days after commencement of new construction or reconstruction (§ 60.15) of an existing facility or prior to the commencement of a potential modification of an existing facility. Section 114 of the Act provides that the Administrator may require such reports "for the purpose * * * of determining whether any person is in violation of any such standard * * *." This notification is not to be used for approval or disapproval of the planned construction or physical or operational change; the purpose is to allow the Administrator to locate sources which will be subject to regulations in this part and to inform the sources about applicable regulations in an effort to minimize future problems. Notification prior to commencement of a potential modification will also allow the Administrator to require emission testing before and after the physical or operational change if necessary to determine whether or not there is an emission increase. Submittal of pertinent information is required at the time of notification prior to commencement of a potential modification, so that if a determination on whether an emission increase will occur can be made without emission tests or continuous monitoring data, the Administrator can advise the source owner or operator concerning the application of standards of performance prior to the physical or operational change.

Owners or operators who are considering a physical or operational change to an existing facility are encourage to request, pursuant to 40 CFR 60.5, a determination by the Administrator of whether such a change is a modification. Such request should be made as soon as possible prior to commencement of the change and shall be separate from the notification requirement proposed under § 60.7(a) (4).

RECONSTRUCTION

Section 60.15, as proposed herein clarifies that an existing facility becomes an affected facility when it is reconstructed if a substantial portion of its components is replaced irrespective of any change in emission rate. The Administrator will consider, on a case-by-case basis, technical and economic parameters in determining whether a substantial portion of a facility has been replaced. Reconstruction of a facility which meets the specifications proposed under § 60.15 constitutes new construction rather than modification. When a facility is completely replaced with a newly constructed affected facility, that facility is subject to standards of performance. The purpose of this proposed provision is to discourage the perpetuation of a facility, instead of replacing it at the end of its useful life with a newly constructed affected facility. It should be recognized that it is generally the practice of the industries currently covered by standards of performance to close an old existing facility rather than to reconstruct it by using a minor part of it and replacing the remaining portion. Because of this, the proposed provision will have little, if any impact on industries currently covered. As standards of performance are proposed for additional source categories in the future, replacements which will be considered reconstruction will be identified in the subparts.

COMMENTS

Interested persons may participate in this rulemaking by submitting written comments (in triplicate) to the Emission Standards and Engineering Division, Environmental Protection Agency, Research Triangle Park, North Carolina 27711, Attention: Mr. Don R. Goodwin. All relevent comments postmarked not later than November 29, 1974 will be considered. Comments received will be available for public inspection at the Office of Public Affairs, 401 M Street, SW., Washington, D.C.

This notice of proposed rulemaking is issued under the authority of sections 111 and 114 of the Clean Air Act, as amended (42 U.S.C. 1857c-6, 1857c-9).

Dated: October 4, 1974.

JOHN QUARLES,
Acting Administrator.

It is proposed to amend Part 60 of Chapter I, Title 40 of the Code of Federal Regulations as follows:

Subpart A—General Provisions

1. In § 60.2 paragraphs (d) and (h) are revised and paragraphs (aa) and (bb) are added. As amended § 60.2 reads as follows:

§ 60.2 Definitions.

* * * * *

(d) "Stationary source" means any building, structure, facility, or installation which emits or may emit any air pollutant and which contains any one or combination of the following:

(1) Affected facilities.

(2) Existing facilities.

(3) Facilities for which no standards are applicable.

* * * * *

(h) "Modification" means any physical change in, or change in the method of operation of, an existing facility which increases the amount of any air pollutant (to which a standard applies) emitted into the atmosphere by that facility or which results in the emission of any air pollutant (to which a standard applies) into the atmosphere not previously emitted.

* * * * *

(aa) "Existing facility" means, with reference to a stationary source, any apparatus of the type for which a standard is promulgated in this part, and the construction or modification of which was commenced before the date of proposal of that standard; or any apparatus which could be altered in such a way as to be of that type.

HeinOnline -- 39 Fed. Reg. 36948 1974

(bb) "Capital expenditure" means an expenditure for long-term additions or betterments properly chargeable to a capital assets account.

2. In § 60.7, paragraphs (a)(1) and (a)(2) are revised, and paragraphs (a)(3) and (a)(4) are added. As amended § 60.7(a) reads as follows:

§ 60.7 Notification and recordkeeping.

(a) Any owner or operator subject to the provisions of this part shall furnish the Administrator written notification as follows:

(1) A notification of the date of commencement of construction (or reconstruction as defined under § 60.15) of an affected facility postmarked no later than 30 days after such date.

(2) A notification of the anticipated date of initial startup of an affected facility postmarked not more than 60 days nor less than 30 days prior to such date.

(3) A notification of the actual date of initial startup of an affected facility postmarked within 15 days after such date.

(4) A notification of any physical or operational change to an existing facility which may increase the emission rate of any air pollutant to which a standard applies, unless that change would not be considered a modification under an applicable subpart or in § 60.14(e). This notice shall be postmarked at least 60 days prior to the commencement of the change and shall include information describing the precise nature of the change, present and proposed emission control systems, productive capacity of the facility before and after the change, and the expected completion date of the change.

* * * * *

3. Subpart A is amended by adding §§ 60.14 and 60.15 as follows:

§ 60.14 Modification.

(a) Except as provided under paragraphs (d), (e) and (f) of this section, any physical or operational changes to an existing facility which result in an increase in emission rate to the atmosphere of any pollutant to which a standard applies shall be a modification. Upon modification, an existing facility shall become an affected facility for each pollutant to which a standard applies and for which there is an increase in emission rate.

(b) Emission rate shall be expressed as kg/hr of any pollutant discharged into the atmosphere for which a standard is applicable. The Administrator may use, but is not limited to, the following to determine emission rate:

(1) Emission factors specified in the latest issue of "Compilation of Air Pollutant Emission Factors," EPA Publication No. AP-42;

(2) Material balances;

(3) Manual emission tests or continuous monitoring systems. When the emission rate is based on results from manual emission tests or continuous monitoring systems, the procedures specified in Appendix C of this part shall be used to determine whether an increase in emission rate occurred. Tests shall be conducted under such conditions as the Administrator shall specify to the owner or operator based on representative performance of the facility.

(c) The addition of an affected facility to a stationary source as an expansion to that source or as a replacement for an existing facility shall not by itself bring within the applicability of this part any other facility within that source.

(d) A modification shall not be deemed to occur if an existing facility undergoes a physical or operational change that results in an increase in the emission rate into the atmosphere of any pollutant to which a standard applies provided the owner or operator demonstrates to the Administrator's satisfaction that the total emission rate of any such pollutant from all existing and affected facilities at the stationary source has not increased.

(1) Such demonstration shall be in writing and shall include:

(i) The name and address of the owner or operator.

(ii) The location of the stationary source.

(iii) A complete description of the existing facility undergoing the physical or operational change, any applicable control system, and the physical or operational change to such facility.

(iv) The emission rates into the atmosphere from the existing facility of each pollutant to which a standard applies before and after the physical or operational change takes place.

(v) A complete description of each existing and affected facility and the control systems, if any, for those facilities within the stationary source where the emission rate of each pollutant in question will be decreased to compensate for the increase in emission rate from the existing facility undergoing the physical or operational change.

(vi) The emission rates into the atmosphere of the pollutants in question from each existing and affected facility described under paragraph (d)(1)(v) of this section both before and after the improvement of installation of any applicable control system or any physical or operational changes to such facilities to reduce emission rate.

(vii) A complete description of the procedures and methods used to determine the emission rates.

(2) To be acceptable by the Administrator, the decrease in the emission rate from the existing and affected facilities described under paragraph (d)(1)(v) of this section must be demonstrated by actual testing of the emissions in accordance with § 60.8(b) of this part and accomplished through the installation or improvement of a control system or through physical or operational changes to those facilities including reducing the production of a facility or closing a facility. Decreases in emissions required by a State implementation plan approved or promulgated under Part 52 of this chapter will not be acceptable. The emission testing shall be performed within 180 days of the completion of the physical or operational change to the existing facility or at such times as the Administrator may specify.

(3) Emission rates established for the existing facility which is undergoing a physical or operational change resulting in an increase in the emission rate and for the existing facilities described under paragraph (d)(1)(v) of this section to compensate for such an increase in emission rate shall become the baseline for determining whether such facilities undergo a modification in the future.

(4) Any emission rate in excess of that rate established as the baseline for determining future modifications under paragraph (b)(3) of this section and any emission rate in excess of that rate established for the affected facilities described under paragraph (d)(1)(v) of this section shall be a violation of these regulations. Such violations shall be determined in accordance with the procedures established under § 60.8 of this part.

(e) The following shall not, by themselves, be considered modifications under this part.

(1) Maintenance, repair, and replacement which the Administrator determines to be routine for a source category, subject to the provisions of paragraph (c) of this section and § 60.15.

(2) An increase in production rate of an existing facility, if that increase can be accomplished without a major capital expenditure on the stationary source containing that facility.

(3) An increase in the hours of operation.

(4) Use of an alternative fuel or raw material if, prior to the date any standard under this part becomes applicable to that source type, as provided by § 60.1, the existing facility was designed to accommodate that alternative use. A facility shall be considered to be designed to accommodate an alternative fuel or raw material if provisions for that use were included in the final construction specifications. Conversion to coal required for energy considerations, as stipulated in section 119(d)(5) of the Act, shall not be considered a modification.

(5) The addition or use of any system or device whose primary function is the reduction of air pollutants, except when an emission control system is removed or is replaced by a system which the Administrator considers to be less efficient.

(f) Special provisions set forth under an applicable subpart of this part shall supersede any conflicting provisions of this section.

§ 60.15 Reconstruction.

(a) An existing facility shall be considered an affected facility by the Administrator upon reconstruction through the replacement of a substantial portion of the existing facility's components irrespective of any change of emission rate. The owner or operator may request the Administrator to determine whether the proposed reconstruction involves replacement of a substantial portion of the existing facility's components based on the capital cost of the reconstruction in comparison to the capital cost of all new construction and other technical and economic considerations.

HeinOnline -- 39 Fed. Reg. 36949 1974

3. Part 60 is amended by adding Appendix C as follows:

APPENDIX C—DETERMINATION OF EMISSION RATE CHANGE

(1) *Introduction.* 1.1 The following method shall be used to determine whether a physical or operational change to an existing facility resulted in an increase in the emission rate to the atmosphere. The method used is the Student's t test, commonly used to make inferences from small samples.

(2) *Data.* 2.1 Each emission test shall consist of n runs (usually 3) which produce n emission rates. Thus two sets of emission rates are generated, one before and one after the change.

2.2 When using manual emission tests, except as provided in § 60.8(b) of this part, the reference methods of Appendix A to this part shall be used in accordance with the procedures specified in the applicable subpart both before and after the change to obtain the data.

2.3 When using continuous monitors, the facility shall be operated as if a manual emission test were being performed. Valid data using the averaging time which would be required if a manual emission test were being conducted shall be used.

(3) *Procedure.* 3.1 Subscripts a and b denote prechange and postchange respectively.

3.2 Calculate the arithmetic mean emission rate, E, for each set of data using Equation 1.

Equation 1

$$\overline{E}=\frac{\sum_{i=1}^{n}E_i}{n}=\frac{E_1+E_2+\ldots+E_n}{n}$$

where:

E_i=Emission rate for the i th run

n=number of runs

3.3 Calculate the sample variance, S^2, for each set of data using Equation 2.

Equation 2

$$S^2=\frac{\sum_{i=1}^{n}(E_i-\overline{E})_2}{n-1}=\frac{\sum_{i=1}^{n}E_i^2-\left(\sum_{i=1}^{n}E_i\right)^2\Big/n}{n-1}$$

3.4 Calculate the pooled estimate, S_p, using Equation 3.

Equation 3

$$S_p=\left[\frac{(n_a-1)S_a^2+(n_b-1)S_b^2}{n_a+n_b-2}\right]^{1/2}$$

3.5 Calculate the test statistic, t, using Equation 4.

Equation 4

$$t=\frac{\overline{E}_b-\overline{E}_a}{S_p\left[\frac{1}{n_a}+\frac{1}{n_b}\right]^{1/2}}$$

(4) *Results.* 4.1 If $\overline{E}_b>\overline{E}_a$ and $t>t'$, where t' is the critical value of t obtained from Table 1, then with 95 percent confidence the difference between $\overline{E}_b$ and $\overline{E}_a$ is significant, and an increase in emission rate to the atmosphere has occurred.

TABLE 1

Degrees of Freedom (n_a+n_b-2)	*t' (95 percent confidence level)*
2	2.920
3	2.353
4	2.132
5	2.015
6	1.943
7	1.895
8	1.860

For greater than 8 degrees of freedom, see any standard statistical handbook or text.

(5) *Example:*

5.1 Assume the two performance tests produced the following set of data:

	Test a	*Test b*
Run 1	100	115
Run 2	95	120
Run 3	110	125

5.2 Using Equation 1—

$$\overline{E}_a=\frac{100+95+110}{3}=102$$

$$\overline{E}_b=\frac{115+120+125}{3}=120$$

5.3 Using Equation 2—

$$S_a^2=\frac{(100-102)^2+(95-102)^2+(110-102)^2}{3-1}=58.5$$

$$S_b^2=\frac{(115-120)^2+(120-120)^2+(125-120)^2}{3-1}=25$$

5.4 Using Equation 3—

$$S_p=\left[\frac{(3-1)(58.5)+(3-1)(25)}{3+3-2}\right]^{1/2}=6.46$$

5.5 Using Equation 4—

$$t=\frac{120-102}{6.46\left[\frac{1}{3}+\frac{1}{3}\right]^{1/2}}=3.412$$

5.6 Since $(n_1+n_2-2)=4$, $t'=2.132$ (from Table 1). Thus since $t>t'$ the difference in the values of $\overline{E}_a$ and $\overline{E}_b$ is significant, and there has been an increase in emission rate to the atmosphere.

[FR Doc.74-23835 Filed 10-11-74;8:45 am]

HeinOnline -- 39 Fed. Reg. 36950 1974