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**ENVIRONMENTAL PROTECTION
AGENCY**
40 CFR Part 60
[AD-FRL-2173-2]
**Standards of Performance for New
Stationary Sources; Synthetic Fiber
Production Facilities**
AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule and notice of public hearing.

SUMMARY: The proposed standards would limit emissions of volatile organic compounds (VOC) from new and reconstructed synthetic fiber production facilities that use "solvent-spinning" processes. The proposed standards implement Section 111 of the Clean Air Act and are based on the Administrator's determination that emissions from the manufacture of synthetic fibers cause or contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare. The intent is to require that VOC emissions from new and reconstructed solvent-spun synthetic fiber production facilities be controlled to the level achievable through application of the best demonstrated system of continuous emission reduction, considering costs, nonair quality health and environmental impacts, and energy requirements. The proposed standards would not apply to modified facilities.

A public hearing will be held, if requested, to provide interested persons an opportunity for oral presentation of data, views, or arguments concerning the proposed standards.

DATES: *Comments.* Comments must be received on or before February 11, 1983.

Public Hearing. If anyone contacts EPA requesting to speak at a public hearing by February 23, 1982, a public hearing will be held on January 11, 1983, beginning at 9 a.m. Persons interested in attending the hearing should call Mrs. Naomi Durkee at (919) 541-5578 to verify that a hearing will occur.

Request to Speak at Hearing. Persons wishing to present oral testimony must contact EPA by December 23, 1982.

ADDRESSES: *Comments.* Comments should be submitted (in duplicate if possible) to: Central Document Section (A-130), Attention: Docket Number A-80-7, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, D.C. 20460.

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hearing will be held on January 11, 1983. Persons interested in attending the hearing should call Mrs. Naomi Durkee at (919) 541-5578 to verify that a hearing will occur. Persons wishing to present oral testimony should notify Mrs. Naomi Durkee, Standards Development Branch (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, Telephone number (919) 541-5578.

Background Information Document.

The background information document (BID) for the proposed standards may be obtained from the U.S. EPA Library (MD-35), Research Triangle Park, North Carolina 27711, telephone (919) 541-2777. Please refer to "Synthetic Fiber Production Facilities—Background Information for Proposed Standards." (EPA-450/3-82-011a).

Docket: Docket No. A-80-7, containing supporting information used in developing the proposed standards, is available for public inspection and copying between 8:00 a.m. and 4:00 p.m., Monday through Friday, at EPA's Central Docket Section, West Tower Lobby, Gallery 1, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Mr. Gene Smith, Standards Development Branch, Emission Standards and Engineering Division (MD-13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5624.

SUPPLEMENTARY INFORMATION:

Proposed Standards

The proposed standards would limit emissions of volatile organic compounds (VOC) from new and reconstructed synthetic fiber production facilities that utilize an organic solvent in manufacturing the formed fiber. This would include the production of such fiber types as acrylic, modacrylic, cellulose acetate, spandex, etc. The standards would not apply to modified facilities.

The affected facility to which the proposed standards would apply is each solvent-spun synthetic fiber process, which is defined as the total of all fiber processing equipment having either a spinning solution preparation area or a solvent recovery system in common. The proposed standards would require that VOC emissions from each affected facility that produces acrylic fibers be limited to 10 kilograms (kg) per megagram (Mg) solvent fed to the spinning solution preparation area of precipitation bath. VOC emissions from each affected facility producing fiber

types other than acrylic would be limited to 17 kg per Mg solvent fed to the spinning solution preparation area or precipitation bath. Facilities that produce less than 500 Mg of fiber per year would not be covered by the proposed standards. The owner or operator of an affected facility would be required to measure the amount of makeup solvent introduced to the affected facility and to determine the amount of total solvent used within the affected facility by direct measure or through use of plant process records. Records would be maintained in a form suitable for inspection for at least 2 years.

Summary of Environmental, Energy, and Economic Impacts

In general, the estimated environmental, energy, and economic impacts associated with new source performance standards are based on a 5-year projection of anticipated growth in the industry affected by the standards. Because of the uncertainty associated with growth projections for the synthetic fibers industry, a range of annual growth rates was used to analyze the industry-wide impacts of the proposed standards. The estimates summarized below and throughout this notice reflect the highest estimates of growth in order to present worst-case impacts. Thus, impacts may be less than those presented if actual growth rates are less than estimated.

The proposed standards would reduce projected 1987 nationwide VOC emissions from new and reconstructed solvent-spun synthetic fiber production facilities by as much as 8.8 gigagrams (Gg) (10 thousand tons) per year. This represents a nationwide emission reduction of as much as 63 percent that would occur in the absence of this regulation. Emission reductions would range from about 1.1 Gg (1,200 tons) per year for a dry-spinning acrylic fiber plant to about 1.7 Gg (1,900 tons) per year for an acetate filtration tow plant.

The fifth-year water pollution and solid waste impacts of the proposed standards each represent less than a 1 percent increase over the impacts that would result in the absence of standards of performance.

The incremental energy necessary to operate the additional control equipment required to meet the proposed standards would range from 2 to 3 percent of the total energy required to operate the types of fiber production plants covered by the proposed standards. The total nationwide energy impact of the proposed standards would

be as much as 430 terajoules (403 billion Btu) per year in 1987.

The cumulative industry-wide capital costs would be as much as \$27.8 million by 1987, an 8 percent increase in costs for new facilities. Capital costs for implementing the standards at individual plants would range from \$4.2 to \$5.5 million. Economic analysis indicates that the annualized costs to individual solvent spun fiber plants would range from about \$1.2 million to \$1.3 million. However, there would also be a credit for recovered solvent in the range of \$1.0 to \$1.1 million. Net annualized costs would be about \$0.2 million for an individual plant. The annualized cost to the entire industry by 1987 would be as much as \$7.4 million; however, a corresponding \$6.2 million credit for additional solvent recovery would nearly offset these costs, resulting in net annualized cost to the industry of \$1.2 million by 1987. Analysis indicates the cost of emission control required by the proposed standards is not expected to prevent or hinder expansion or continued production by the solvent-spun synthetic fibers industry. These costs (savings) do not include lost opportunity costs (i.e., the profit or return on investment which could be derived by investing in other than air pollution control equipment).

Standards of performance have other benefits in addition to achieving reductions in emissions beyond those required by a typical State implementation plan. They establish a degree of national uniformity. Further, standards of performance provide documentation which reduces uncertainty in case-by-case determinations of best available control technology (BACT) for facilities located in attainment areas and lowest achievable emission rates (LAER) for facilities located in nonattainment areas. This documentation includes identification and comprehensive analysis of alternative emission control technologies, development of associated costs, an evaluation and verification of applicable emission test methods, and identification of specific emission limits achievable with alternate technologies. The costs are provided for in an economic analysis that reveals the affordability of controls in an unbiased study of the economic impact of controls on an industry.

The rulemaking process that implements a performance standard assures adequate technical review and promotes participation of representatives of the industry being considered for regulation, government, and the public affected by that

industry's emissions. The resultant regulation represents a balance in which government resources are applied in a well-publicized national forum to reach a decision on a pollution emission level that allows for a dynamic economy and a healthful environment.

Rationale

Selection of Source for Control

EPA has identified synthetic fiber production plants as sources of emissions that cause or contribute significantly to air pollution that may reasonably be anticipated to endanger public health or welfare. As a result, the Agency listed this source on a priority list for development of new source performance standards (40 CFR 60.16, 44 FR 49222 (August 21, 1979)), in accordance with Section 111(b)(1)(A) and Section 111(f) of the Clean Air Act.

Man-made fibers include two types of products, the semisynthetics or cellulose (e.g., viscose rayon, cellulose acetate, and triacetate) and the true synthetics or noncellulosics (e.g., polyester, nylon, acrylic and modacrylic, spandex, and polyolefin). These nine fiber types comprise over 99 percent of the total production of man-made fibers in the United States. Solvent-spun synthetic and semisynthetic fibers constitute 16 percent of total U.S. fiber capacity. Semi-synthetics are formed when naturally occurring polymeric materials, such as cellulose, are dissolved or dispersed in a suitable solvent and then spun into fine filaments. True synthetics result from the polymerization of (usually) petroleum derivatives into long chain molecules (polymers), which are then processed into fiber form. For simplicity, the term "synthetic" will be used throughout this notice to mean both synthetic and semisynthetic.

The three major fiber manufacturing processes used in this industry are wet, dry, and melt spinning. A fourth, reaction spinning, is also used but to a far lesser extent. The spinning process used for a particular polymer depends on its melting point, heat stability, and solubility in organic solvents. Wet and dry spinning processes use large quantities of organic solvents to dissolve the polymer prior to extrusion. These processes would be covered by the proposed standards because large amounts of the organic solvents are emitted as VOC's to the atmosphere by these facilities. A typical dry spinning fibers plant with a production of 25 million kg per year would emit anywhere from 1 million to 3 million kg (about 1,000 to 3,000 tons) per year of VOC's, at existing control levels.

In 1980 there were 15 identified synthetic fiber manufacturing plants operating in the United States that utilized organic solvent in their spinning process. Production and capacity for the individual plants vary widely, as do the resulting VOC emissions. Individual facilities potentially affected by the proposed standards would produce from less than a thousand Mg to several hundred thousand Mg of product annually. Fiber types currently produced by solvent spinning methods include acrylic, modacrylic, cellulose acetate and triacetate, and spandex; various other fibers of lower production volumes are also subject to the proposed standards.

In the melt spinning process, the polymer is melted, extruded, and then cooled to solidify the extruded filaments. VOC emission rates from melt spinning processes are considerably lower than those of dry, wet, and reaction spinning fiber formation processes because organic solvents are not used in the fiber spinning process. Also, the nature of the emission points and the types of emissions are significantly different. Therefore, melt spinning synthetic fiber production facilities would not be subject to the proposed standards, but may be considered under a separate new source performance standard in the future consistent with EPA's priorities for setting standards.

The only product known to be produced in the United States using the reaction spinning process is spandex (also produced with the dry spinning process), and this process is used at only two plants. Solvent recovery and process data obtained from the plants indicate that significant technological problems exist with application of VOC emission controls on this process. Carbon adsorbers used at these facilities exhibit extreme fouling; apparently this results from continued polymerization of materials carried over from the fiber spinning and processing steps. Information on the use of carbon adsorption is available, and further investigation into VOC emission control is continuing by EPA and the plants involved. The use of carbon adsorption as a control technology is not sufficiently developed, however, to be considered "demonstrated" as meant by Section 111 of the Clean Air Act. The technology will be evaluated to determine if it is "demonstrated" as the information becomes further developed. Other control techniques considered for application to the reaction spinning process were absorption scrubbing and incineration. Absorption scrubbing

would not be a viable option because it would not be technically feasible to control the type of solvent used using common scrubbing techniques. Incineration of the VOC emissions may be feasible technologically but would be exorbitantly costly (an incremental cost as high as \$3,600 per ton of emission reduction when comparing incineration to the currently used carbon adsorption system). There are no other systems of emission control suitable for this process; therefore, reaction-spun spandex production facilities would not be subject to the proposed standards. Reaction spinning facilities, will, however, again be considered for coverage during the 4-year review of the standards.

Facilities that produce spandex using the dry spinning process would be covered by the standards. The only dry-spun spandex plant known in the United States is operated by Du Pont. Data obtained from this plant indicate that it is currently using the best demonstrated control technology upon which the standards are based and is achieving the proposed emission limit for nonacrylic fiber production facilities, 17 kg per Mg solvent feed. Therefore, there would be no adverse impacts on new facilities subject to the standard if they employ the same emission controls as Du Pont's existing plant. New spandex facilities are expected to be built in the near future and other producers besides Du Pont could enter the market. To ensure that the best system of control could be used at all new facilities, dry-spun spandex would be covered by the proposed standards.

The manufacturing processes as well as the pollutants involved in viscose rayon production (a wet/reaction spinning) are quite different from those of the other fiber types. Rayon manufacture by the viscose process is a significant source of carbon disulfide and hydrogen sulfide emissions. However, EPA was unable to identify control technology that would result in emission reductions beyond existing control levels. Furthermore, industry sources report that the high capital, labor, maintenance, and energy intensive characteristics of the viscose rayon process will in all likelihood prohibit further expansion of viscose rayon capacity. Also, new nonviscose processes are currently in the developmental stages. These new processes under development do not require the use of sulfur-containing compounds. It appears that the rayon industry will not increase capacity until and unless this nonviscose process can be implemented. These facts have led to

the exclusion of viscose rayon processes from the source category subject to the proposed standards. Emissions generated during manufacture of rayon by the viscose process may be considered for regulation under a separate standard.

Facilities that produce less than 500 Mg (551 tons) of fiber per year would be exempt from the standards. This is intended to exempt research and development facilities and specialty fiber producers that operate on an intermittent basis and manufacture small quantities of fiber. These facilities comprise less than 0.3 percent of the total U.S. synthetic fiber capacity, and emission from these facilities are correspondingly negligible.

This exemption is appropriate since the cost of recovery of all possible experimental solvents used at a given research and development facility would be disproportionately high, when compared to the small reduction in VOC emissions. A solvent recovery system for one type solvent may be ineffective, or unsuited for recovery of a different solvent. Therefore, recovery of all possible solvents may require redesign and rebuilding of the recovery system each time a different solvent is introduced. Some specialty fiber types are also produced in small quantities on an intermittent basis, and operation of a recovery system would be disproportionately costly, when compared to the small reduction in VOC emissions.

Selection of Pollutant

The wet and dry organic solvent spinning processes require the use of large amounts of solvents such as dimethylformamide, dimethylacetamide, acetone, diethyl sulfone, succinonitrile, etc. For each unit mass of fiber produced, a unit of polymer is dissolved in about 2 to 3 units of solvent. A plant producing about 100 million kg of fiber annually, for instance, would therefore use about 200 to 300 million kg of solvent. Because of the large amounts of solvent used, the economics of the industry require that the solvent used in dissolving or spinning of the fiber be recovered for reuse. Typically, 94 to 97 percent of the solvent used at existing plants is captured and recovered directly from the spinning cells or cabinets, where there is almost total containment. The only efficiency-limiting factors at spinning are the degree of transfer to the control device (ducting), and the efficiency of the control device itself, including subsequent distillation and condensing. A large portion of the remaining solvent used in the solvent spinning process is

emitted as VOC from pre- and post-spinning process steps. Although this may seem small on a percentage basis, 3 to 6 percent, the absolute amounts of solvent VOC emissions are quite large. As previously noted, a typical dry spinning fibers plant with a production of 25 million kg of fiber per year would emit anywhere from 1 million to 3 million kg (1,000 to 3,000 tons) per year of VOC's at existing control levels.

Volatile organic compounds (VOC) are precursors to the formation of ozone and other oxidants. Photochemical oxidants result in a variety of adverse impacts on health and welfare, including impaired respiratory function, eye irritation, necrosis of plant tissue, and deterioration of selected synthetic materials, such as rubber. Further information on these effects can be found in the EPA document entitled "Air Quality Criteria for Ozone and Other Photochemical Oxidants" (EPA-600/8-78-004).

Study of the industry has also revealed that polymer particulates are emitted from storage and mixing areas, but only intermittently and in relatively small amounts; oils in the form of aerosols are also emitted at some texturizing steps. These emissions are an order of magnitude smaller than the solvent VOC emissions. The cost of controlling this small amount of particulate using demonstrated technology would be unreasonable. Therefore, the only pollutant to be regulated by the proposed standards is VOC.

Selection of the Affected Facility

The choice of the affected facility for this standard is based on the Agency's interpretation of section 111 of the Act and judicial construction of its meaning.¹ Under section 111, the NSPS must apply to "new sources;" "source" is defined as "any building, structure, facility, or installation which emits or may emit any air pollutant" (Section 111(a)(3)). Most industrial plants, however, consist of numerous pieces or groups of equipment that emit air pollutants, and that might be viewed as "sources." EPA, therefore, uses the term "affected facility" to designate the equipment within a particular kind of plant that is chosen as the "source" covered by a given standard.

In choosing the affected facility, EPA must decide which pieces or groups of equipment are the appropriate units for separate emission standards in the particular industrial context involved.

¹ The most important case is ASARCO vs EPA, 578 F. 2d 319 (D.C. Cir. 1978).

The Agency must do this by examining the situation in light of the terms and purpose of Section 111. One major consideration in this examination is that the use of a narrower definition may result in bringing replacement equipment under the NSPS sooner; if, for example, an entire plant were designated as the affected facility, no part of the plant would be covered by the standard unless the plant as a whole is "modified" or "reconstructed." (The plant as a whole could be considered modified only if a physical change to one or more units of equipment in the plant resulted in an increase in the aggregate emissions from the entire plant. Similarly, the plant as a whole could be reconstructed only if replacements were made to the extent that their cost exceeded 50 percent of the cost of a whole new plant.)

If, on the other hand, each piece of equipment is designated as the affected facility, then as each piece is replaced, the replacement piece would be a new source subject to the standard. Since the purpose of Section 111 is to minimize emissions by the application of the best system of continuous air pollution control that the Administrator determines has been adequately demonstrated (considering cost, other health and environmental effects, and energy requirements), there is a presumption that a narrower designation of the affected facility is proper. This ensures that new emission sources within plants will be brought under the coverage of the standards as they are installed. This presumption can be overcome, however, if the Agency concludes that the relevant statutory factors (technical feasibility, cost, energy, and other environmental impacts) point to a broader definition. The relevance of these factors is discussed below.

There were four alternatives considered for the affected facility: (1) Each individual process point (such as filtering, spinning, washing, drying) along a fiber production line; (2) each line producing a single type of fiber; (3) each group of lines with a common spinning solution preparation area or solvent recovery system; and (4) the entire plant.

The first alternative of designating each individual process point in a line as an affected facility would not be feasible for both technical and cost reasons. Since VOC emissions from the various points are normally combined and ducted to a single emission control device and solvent recovery system or to the atmosphere, it would be impossible to determine, through

measurement of gaseous emissions, controlled emission rates from each point unless a separate control device were installed for each point. This means of emission control would be technically impractical and exorbitantly costly. Furthermore, the numerous VOC emission points along a production line (many of which are fugitive) would cause the cost for testing separate emission points to be very high. Determining emission rates through material balance would not be possible either. The solvent is introduced into the process line at the beginning solution preparation step and can be measured at that point. From there, however, there is no practical way to determine how much solvent passes into or from any process step. In addition, the number and arrangement of process steps involved in synthetic fiber production vary from one type of fiber to another and from one plant to another, even those producing the same type of fiber. Correspondingly, emission rates for a specific piece of equipment could vary, depending on the type of fiber being produced or the type of process being used. For example, a dryer at a wet-spun acrylic fiber plant would have a different emission rate from a dryer at a dry-spun acrylic fiber plant or acetate fiber plant. Therefore, selecting each process point as an affected facility with separate emission limits for each category of process points is not technically or administratively practicable.

The second alternative, designating each line producing a single type of fiber as an affected facility, would be more feasible than the first alternative. Emission rates within a single plant would not vary significantly from one line to another producing the same type of fiber. However, the process lines from spinning solution preparation through to packaged products are not discrete. For example, a single spinning solution preparation area may supply several spinning machines, which in turn may feed spun fiber to one or two dryers. In other words, the equipment in the several process lines are integrated, and for technical and economic reasons each plant's particular combination of equipment is unique. Existing plants also typically group several lines to share a common solvent recovery system and solution preparation area. These typical industry practices are expected to be incorporated into any new plants built in the future. With such an arrangement, it would be impossible to determine emission rates for each line in a group. Therefore, the second alternative of designating each line as

an affected facility has not been selected.

The third alternative of designating each group of lines with a common solution preparation area or solvent recovery system as an affected facility represents the smallest unit from which emissions can be determined reasonably, from both a technical and cost standpoint. VOC emission control could be determined by measuring the amount of solvent introduced into the solution preparation area (or areas) and the amount returned from the solvent recovery system (or systems) serving the group of lines. This alternative would accommodate the high degree of integration within both the production stages and emission control systems and would avoid the technical difficulties of selecting and enforcing numerical emission limits for individual process steps or lines. Each line with its own solution preparation area but sharing a common recovery system with other lines was not considered for designation as a separate affected facility. In order to determine emissions from such an affected facility, it would be necessary to shut down all lines except the line being tested for the period of the performance test, an unreasonable and economically burdensome length of time. Therefore, the proposed standards designate the affected facility as each "solvent spun synthetic fiber process," which is defined as the total of all equipment having either a spinning solution preparation system or a solvent recovery system in common and that is used to manufacture one or more types of synthetic fiber. It includes solution preparation, spinning, fiber processing, and solvent recovery. Each solvent spun synthetic fiber line with its own spinning solution preparation system and its own solvent recovery system would be considered a separate affected facility.

Polymer production areas are not considered part of the affected facility. Emissions that result from the manufacture of various polymers used to make fibers are being considered for a separate new source performance standard.

The fourth alternative, the entire plant, was considered in case it was necessary to go beyond a more narrow designation for technical, cost, or other reasons. Since the third alternative would not impose unreasonable adverse impacts on synthetic fiber manufacturers, designation of the entire plant as the affected facility is not considered necessary or desirable.

Selection of Basis of the Proposed Standards

Section 111 of the Clean Air Act, as amended, requires that standards of performance reflect the degree of emission control achievable through application of the best technological system of continuous emission reduction which (taking into consideration the cost of achieving such emission reduction, and any nonair quality health and environmental impact, and energy requirements) has been adequately demonstrated.

Control Options. All present-day, solvent-spun fiber producers have an economic incentive to recover increasingly valuable process solvent. Typically, solvent is present in the greatest amounts in the gas and liquid streams into which polymer solutions or prepolymers are extruded. Therefore, recovery is most efficient and economical from these sources that produce the highest concentrations of solvent. This is referred to as the primary recovery system. Presently, domestic synthetic fiber manufacturing processes recover (using the primary recovery system) between 94 and 97 + percent of the total solvent introduced into the manufacturing process. This efficiency results from total capture of solvent vapor from the spin cell or cabinet, and transfer to control devices, distillation equipment, and condensers. Currently used recovery devices include scrubbers, absorption columns, condensers, and carbon adsorbers. The degree of solvent recovery achieved is dependent upon the number of process steps served by solvent vapor capture devices, the efficiency of each solvent vapor capture device, and the efficiency of the solvent recovery equipment.

The majority of VOC emissions not presently recovered by companies originate from process steps that are not serviced by the primary recovery system. Examples are the pre-spinning (solution mixing and filtering), post-spinning (washing, drawing, crimping, heat setting, and drying), and solvent recovery operations. If solvent capture and recovery schemes are extended to these processes, additional VOC emission control is possible. The degree of additional emission control will depend on the number of process points served by the capture and recovery system, and the system's efficiency.

VOC emissions captured at various emission points are ducted to a control device where the solvent is separated from the air stream and then sent to a purification system to remove contaminants from the solvent. Control devices, such as condensers, carbon

adsorbers, scrubbers, and distillation columns, are used extensively in the industry. Efficiencies of 98 to 99 percent are common with this type of equipment. One notable exception is carbon adsorbers that treat VOC emissions from cellulose filter tow dryers. Due to the high moisture content and residual oils in the gas stream from these dryers, the carbon adsorbers currently used by filter tow producers are only about 92 percent efficient. Another exception is a carbon adsorber treating a mixture of two solvents at a cellulose triacetate yarn plant and that is achieving only about 95 percent efficiency. This situation at this plant is considered unique. No other fiber plants were found that mix two or more solvents in fiber manufacture or solvent recovery. This technique should, therefore, be considered limited to cellulose triacetate filament yarn plants.

The most significant variable affecting the overall level of solvent recovery (and emission reduction), however, is not a function of the control device, but rather the degree of capture of the solvent vapors.

The most effective VOC emission capture system observed in the industry is used at an acrylic fiber production facility. A large portion of the solvent vapor generated during the manufacture of fiber is captured by enclosures that encase entire segments of the process line. These enclosures were originally designed and constructed with two objectives: (1) To minimize diffusion of solvent vapor into the room ventilation air in order to reduce worker exposure, and (2) to minimize the capture and unnecessary treatment of uncontaminated room air. By enclosing process points where fugitive solvent emissions are typically uncontrolled, an increase in overall efficiency of solvent recovery is accomplished. Enclosures reduce the volume of dilution air required to contain the solvent vapor for transport from the workplace. Different types of enclosures are used at different process stages. At the filtering stage, enclosures may consist of hoods and movable or flexible curtains that surround the filter press and extend to the floor. At spinning, enclosures may be glass screens, with self-closing doors for worker access. At those points where fiber is continuously transported from one process step to another, the fiber bundle may be transported within metal or glass ducting. Examination of solvent use and emission data greater than 90 percent overall efficiency in capturing VOC emissions at each of the process points to which they may be applied. •

Enclosures are currently in use domestically at one acrylic and one acrylic/modacrylic fiber production plant. This capture technology is adequately demonstrated for both acrylic and modacrylic fiber production facilities. Enclosures are not being used at cellulose acetate filter tow plants in the United States. Filter tow producers have not yet found it profitable to enclose pre- and post-spinning portions of the manufacturing process. Also, the threshold limit value (TLV) as set by the Occupational Safety and Health Administration for worker exposure to acetone, the solvent used in production of filter tow, is 1,000 ppm, a level easily achieved through room ventilation. Therefore, there has been little incentive for filter tow producers to capture and recover acetone from pre- and post-spinning steps of the process. One producer, however, is operating enclosures on a pilot plant to determine their feasibility. In addition, a Japanese filter tow producer has been using enclosures successfully since 1980 and reports an overall recovery efficiency of over 80 percent, with no operational or safety problems. Enclosure technology is also currently applied at viscose rayon fiber plants. The application of enclosure technology to a fiber production process is more a function of the physical characteristics (or layout) of the production train rather than the individual process parameters (dryer temperature, solvent/polymer ratio, etc.) that might differentiate one production technique from another. The basic similarities of all fiber spinning and pre- and post-spinning steps clearly allows application of enclosure technology to all fiber production processes, with the exception of cellulose acetate filament yarn manufacture. Based on this information and the successful use of enclosures on a variety of fiber production facilities, EPA has concluded that enclosures as VOC emission capture devices are a demonstrated technology that can be broadly applied to all solvent-spun synthetic fiber production facilities.

When enclosures are applied to those process stages that typically emit the largest amounts of solvent vapor (e.g., spin cell exits or fiber dryers), emission reductions from 31 to 47 percent below baseline are achieved at individual plants. (Baseline refers to those emission levels that would occur in the absence of new source performance standards.) Furthermore, the same techniques can be extended to even more processing points (e.g., washing, drawing, crimping, etc.) for an even greater reduction in VOC emissions. A

60 to 76 percent reduction beyond the baseline emission rate could be achieved at individual plants by installing enclosure systems at these additional process points. Based on demonstrated experience of companies using enclosures, it is EPA's judgment that this type of capture system will not interfere with the normal processing of the formed fiber (i.e., would not present any operational or safety problems) for all fiber processes except acetate filament yarn, which is discussed below. Because of concern expressed by several fiber producers during development of the proposed standards, EPA emphasizes that its conclusions regarding the appropriateness of enclosure technology apply only to new or reconstructed facilities. Requiring enclosures on pre- and post-spinning operations at existing facilities not undergoing reconstruction could result in significant retrofit problems due to plant layout and space limitations. A new or reconstructed facility, on the other hand, could be designed to accommodate enclosures. (Modified facilities would be exempted from the proposed standards as discussed in the section entitled "Modification/ Reconstruction Considerations.")

Enclosures as a means of VOC emission capture may not be feasible for processing cellulose acetate filament yarn, or any other filament yarn fiber because enclosures on post-spinning processing points cannot be easily used. The production process from the spin cell exit onward is unique and can almost be considered a batch operation. Filaments emerging from the spinning cell are manually brought together and immediately wound on bobbins. The bobbins are removed from the base of the spin cell when full. Due to the high take-up rates, bobbins are changed numerous times during the work day. There are no continuous processing stages, and the fiber is only rewound, twisted, or wound on beams. This need for direct and much more frequent worker access than for the other fiber types renders the use of spin cell enclosures infeasible for cellulose acetate filament yarn production.

Therefore, a different approach that has the potential of reducing emissions to similar levels is appropriate for filament yarn processing. This system uses an air management scheme in which ventilation air for the fiber take-up room is drawn from the solution preparation and fiber processing (twisting and beaming) areas. A fraction of this room air is then drawn into the spin cell, where it acts as the evaporation gas, and is subsequently

sent to the solvent recovery system. Another fraction of the take-up room air is used to dilute the high concentration vapor sent to solvent recovery. The overall level of control is dependent upon the amount of take-up room air sent directly to the control device; consequently, it is possible to achieve emission reductions similar to those obtained with enclosures by optimizing the volume of room air treated (55 to 72 percent, depending on the amount of room air treated). The technological limits of this control method are fixed by the mass of solvent being evaporated into the room air, the total volume of room air, and the mass or volume of solvent in room air lost as fugitives from the building. This technology is feasible only when certain solvents with relatively high TLV are used. Acetone, for example, has a TLV of 1,000 ppm. The TLV must be high enough so the vapor concentration in the fiber take-up room can be allowed to increase to a level which can be economically treated.

During the development of the proposed standards, it was determined that within the acrylic fibers segment of the industry there are manufacturing processes that do not involve the use of an organic solvent. Although a viable control option for some plants, this inorganic solvent production process was found to be not applicable to the entire fibers industry. According to experts, acrylic fibers manufactured using a solvent-spinning process cannot be reproduced exactly using inorganic processes. Therefore, the inorganic processes cannot be considered as alternatives to producing those acrylic fibers now manufactured using solvent-spinning techniques. There were also other reasons for eliminating its consideration as a control option for the proposed standards. While the inorganic process would result in an almost complete elimination of solvent VOC emissions, it would also generate a significant water pollution problem. Further, the inorganic solvent process (or portions of the process) is under patent, and a number of complex legal and economic issues could be raised if the proposed standards effectively forced a company to use a specific process that may be owned and protected by a competitor. The mutual competitive positions of the several acrylic fiber producers would be substantially altered, and their customers (textile firms, carpet manufacturers, etc.) would be forced to alter their processes and products to accommodate what would in fact be different products. The acrylic fibers

produced using the large variety of processes have certain specific but different characteristics that are well known and expected by the purchasers for quality control reasons. For these reasons, the inorganic solvent process is not considered a control option available to all segments of the synthetic fibers industry and was not used as a basis for any regulatory alternative.

Regulatory Alternatives. To compare the beneficial environmental impacts of the regulatory alternatives to any potential adverse environmental, energy, or economic impacts, EPA has selected a 5-year period for analysis. Generally, this is the analysis period used for all new source performance standards. Since 5-year projections tend to reflect current economic conditions, estimated growth rates for an industry can change significantly depending on the beginning and ending dates for the 5-year period selected. Because of the uncertainty associated with growth projections, a range of growth rates was used to analyze the industry-wide impacts of the regulatory alternatives. The worst case costs and benefits arising from the highest estimates of growth projections for the industry are presented. Thus, impacts may be less than those presented if actual growth rates are less than estimated.

In order to identify possible regulatory alternatives and analyze their impacts on the synthetic fibers industry, it was necessary to describe the types of plants that would be affected by this standard. No single model plant could adequately characterize all organic solvent spinning processes within the synthetic fibers industry, since each process is somewhat unique from a technical standpoint. Parameters such as fiber production rates, processing sequences, and polymer to solvent ratios vary from one type of fiber to another and often between plants producing the same fiber. Accordingly, five model plants were developed to represent all commonly occurring conditions, including those that would characterize worst case conditions, covering the range of different spinning operations. The models represent typical manufacturing processes and not individual fiber plants. In order to provide a basis for economic analysis, however, a fiber type and its spinning solvent were assigned to each model plant. The model plants represent wet-spun acrylic (Model Plant 1), dry-spun acrylic (Model Plant 2), dry-spun modacrylic (Model Plant 3), dry-spun acetate filter tow (Model Plant 4), and

dry-spun acetate filament and staple (Model Plant 5).

For all the regulatory alternatives for Model Plants 1 through 4, emission rates are based on capture devices that are 90 percent efficient on process stages other than drying (where 100 percent of vapor is ducted to the control devices), and control devices such as carbon adsorbers, scrubbers, and condensers that are assumed to be 98 percent efficient. The only exception is for cellulose acetate filter tow dryer emissions, for which carbon adsorption is only 92 percent efficient. However, because dryer emissions are controlled under baseline conditions, this lower efficiency does not affect the assumption of 98 percent efficiency for other applications, and the resulting emission limits. The differences among alternatives result from the capture of emissions from an increasing number of emission points in the process sequence. The exact emission points controlled depend on the specific fiber production process. The regulatory alternatives for Model Plant 5 are based on varying the volume of fiber take-up room air treated by the control device. The control device (carbon adsorber) is assumed to be 95 percent efficient.

Review of the performance of emission control techniques in the industry led to the identification of three regulatory alternatives that represent three distinct levels of control. Alternative I, referred to as baseline, represents the level of control that would be expected at new plants if no NSPS were established. It is important to note that there are no State or local emission regulations that apply specifically to the production of man-made fibers, nor has EPA published a control techniques guideline (CTG) for the industry. Of the eight States containing fiber production facilities, most employ a guideline regulating VOC emissions that is similar to California's Rule 66. In the absence of an NSPS, a new plant would be expected to control VOC emissions to a greater extent than required by State regulations because of the economic incentive for maximizing solvent recovery, or because of worker exposure limitations.

Therefore, the VOC emission levels presented in Alternative I reflect current industry control practices rather than levels imposed by regulations, and result from the collection of concentrated solvent vapor from within the spin cell and ducting of the vapor to a scrubber, condenser, or adsorber for recovery and reuse. In one case, Model Plant 4 describing cellulose acetate filter tow manufacturing, emissions from the

tow dryer are also captured and controlled.

Alternatives II and III are based on the use of efficient capture (either through physical enclosure or the use of air management) and control of solvent vapor at process stages other than from within the spin cells, such as solution preparation, blending, filtering, fiber drawing, washing, drying, lubricating, crimping, heat setting, finishing, or from the area at the base of the spin cells or spin baths (referred to as spin cell exits).

To analyze impacts of Regulatory Alternatives II and III, it was necessary to make some assumptions as to which emission points would be the most cost-effective to control. At an actual plant, however, control of different combinations of emission points than those selected by EPA for analysis may be appropriate although the overall emission reduction would be about the same.

For Regulatory Alternative II, VOC emissions from the following additional points are assumed to be controlled: Model Plant 1—the spin cell exit, washing, and drawing; Model plant 2—the spin cell exit; Model Plant 3—the dryer; Model Plant 4—the spin cell exit, tow line up to the crimper, and dryer; and Model Plant 5—air management scheme in which room ventilation air from the fiber take-up room and finishing areas are ducted to a control device.

For Regulatory Alternative III, VOC emissions from the following points, in addition to those listed for Alternatives I and II, are assumed to be controlled: Model Plant 1—crimping, steam setting and drying; Model Plant 2—steaming, and drying; Model Plant 3—spin cell exit, drawing, washing, crimping, and filtering; Model Plant 4—crimping; Model Plant 5—an increased volume of air vented to the control device instead of to the ambient air. It is not technically feasible to capture some emission streams at some facilities because these streams are not sufficiently concentrated. Therefore, these emission points are not controlled under Regulatory Alternatives II and III.

The emission rates associated with the three regulatory alternatives were calculated and compared and are shown in the table below.

EMISSION RATES FOR REGULATORY ALTERNATIVES Kg VOC/MG SOLVENT (KG VOC/MG POLYMER)

Model Plant	Alternative I	Alternative II	Alternative III
1.....	14(40)	9(26)	5(13)
2.....	21(45)	14(31)	8(18)
3.....	56(140)	35(88)	14(33)

EMISSION RATES FOR REGULATORY ALTERNATIVES Kg VOC/MG SOLVENT (KG VOC/MG POLYMER)—Continued

Model Plant	Alternative I	Alternative II	Alternative III
4.....	40(120)	22(67)	15(44)
5.....	49(145)	22(68)	14(40)

Under Alternative I (baseline), emissions from fiber plants would range from about 1.9 Gg per year for a dry-spun acrylic plant, to about 2.6 Gg per year for an acetate filtration tow plant. By 1987 nationwide VOC emissions from new synthetic fiber manufacturing plants would increase by as much as 13.7 Gg per year depending on the projected growth rate for the next 5 years. Under Alternative II, 1987 nationwide emissions would be as much as 8.1 Gg per year depending on the growth rate realized during the next 5 years. This represents an emission reduction of up to 41 percent below Alternative I. Emissions from individual fiber plants under Alternative II would range from about 1.3 Gg per year for a dry-spun acrylic plant to about 1.4 Gg per year for an acetate filtration tow plant. Under Alternative III, 1987 nationwide emissions would be as much as 5.1 Gg per year, depending on the growth rate realized during the next 5 years. This represents an emission reduction of up to 63 percent below Alternative I. Emissions from individual fiber plants would range from about 0.8 Gg per year for a dry-spun acrylic plant, to about 0.9 Gg per year for an acetate filtration tow plant.

Both Alternatives II and III involve the use of carbon adsorbers or absorption scrubbers to control VOC emissions. VOC-laden steam condensate from carbon bed regeneration and solvent-laden water from the absorbers are sent to a series of distillation columns for solvent separation; the water fraction is returned to the plant for reuse or is treated and discharged. Insignificant amounts of water pollution would be generated by the control equipment and Alternatives II and III would have no adverse impact on water quality. As part of the control process, the control equipment required under Alternatives II or III would generate minimal solid waste, about 27 Mg (30 tons) of carbon waste that is not recoverable or recycled. No increase in noise levels is anticipated under either alternative.

An increase in energy consumption would result from compliance with either Alternative II or III. The incremental energy increase required to operate the additional control equipment at affected facilities would be

as much as 21 to 70 terajoules (20 to 66 billion Btu) per year at the level of Alternative II, for dry-spun acetate filtration tow and dry-spun acrylic, respectively. The impact under Alternative III would be as much as 44 to 127 terajoules (41 to 119 billion Btu) per year for acetate filtration tow and dry-spun acrylic fiber plants, respectively. Energy requirements for increased control at all affected facilities by 1987 under Alternatives II and III would be 224 and 430 terajoules (210 and 403 billion Btu) per year, respectively. The energy required to operate the additional control equipment at a typical affected facility would amount to about 2 to 3 percent of the total energy (2,700 terajoules or 2,500 billion Btu) required to operate an entire synthetic fiber manufacturing plant.

Both Alternatives II and III are reasonable from an economic perspective. The capital costs of the installed emission control equipment necessary to meet Alternatives II and III, on all affected synthetic fiber manufacturing facilities during the period of 1982 to 1987, would be as much as \$18.0 million and \$27.8 million, respectively. This would be in the range of a 4 to 8 percent increase in cost for new grass-roots installations. Capital costs for implementing Alternative II at individual plants expected to be built would be about \$3.0 million; capital costs for implementing Alternative III would range from \$4.2 to \$5.5 million. The annualized cost of operating this additional equipment at all projected affected facilities during 1987 would be about \$5.0 million and \$7.4 million for Regulatory Alternatives II and III, respectively. However, the annualized costs would be nearly offset by the value of additional solvent recovered, \$3.8 million for Alternative II and \$6.2 million for Alternative III. The net annualized cost to the industry would be \$1.2 million for both Alternative II and Alternative III in 1987. The increase in net annualized costs to individual solvent spun fiber plants for both alternatives would amount to about \$0.2 million. The annualized costs are considered reasonable and are not expected to hinder expansion in the organic-solvent-spun synthetic fiber production industry.

Regulatory Alternative III represents the most effective demonstrated technology and does not impose exorbitant or unacceptable impacts. A significant reduction in VOC emissions would result; there would be no significant water pollution, solid waste, or noise impact; and the energy, cost, and economic impact would be

reasonable. Also, there is no net increase in costs from Alternative II to Alternative III, so the incremental cost per ton of VOC emission reduction is zero. Therefore, Regulatory Alternative III, representing up to 63 percent reduction in VOC emissions, is selected as the basis for the proposed standards.

Selection of Format of the Proposed Standards

A number of formats for the proposed standards were considered. The format selected must not only be compatible with the control options and regulatory alternatives selected, but should also offer relative simplicity of enforcement, minimal recordkeeping, assurance of continuing compliance, and maximum process flexibility for the facility. The formats evaluated are as follows:

A format that limits emissions per unit of time (emission rate commonly used regulatory format and is reasonably straightforward in concept. Therefore, a certain consistency would be achieved by proposing this format. However, the complexity of the processes and the multiplicity of potential VOC sources makes direct gas-phase measurement of emissions impractical if not impossible. The cost of determining emissions from direct emission monitoring would be extremely high.

A format based on concentration of VOC in emission streams requires a minimum of process data, but this type of format is particularly unsuited for the synthetic fiber industry. Air flow rates over and around the various process points within a fiber manufacturing facility are variable and difficult to measure. In some cases, flow rates and VOC concentrations from particular processes within these facilities can only be measured by evaluating room air around the process due to the large number of fugitive VOC sources. Because of these disadvantages, the emission rate and the concentration formats were not selected.

A format based on solvent emissions per unit of polymer fiber product is commonly used within the fibers industry in reporting solvent use and loss. An advantage of this format is that it encourages producers to reduce their overall solvent use per unit of production. Typically, producers have an economic incentive to reduce the solvent-to-polymer ratio used in production of synthetic fibers because of the savings realized in such areas as the cost of solvent recovery operations. Reductions in solvent use in effect also reduce the overall potential to emit VOC's. However, a regulatory format of this type could result in a plant indirectly revealing sensitive production

process values. To specify the relationship between production and solvent use would require knowledge of exact solvent-to-polymer ratios for enforcement. These solvent-to-polymer ratios are generally proprietary. Therefore, this format was not selected.

A mass balance format based on total solvent emissions per unit of solvent feed to the process was also considered. It appears to have none of the disadvantages of the other formats. The major advantage of this format is the simple means of determining VOC emissions through use of a mass balance. The amount of solvent used and recovered and the amount of solvent introduced to make up solvent loss can be metered directly or determined from plant records. Knowledge of these values can then be used in a simple calculation to determine VOC emissions by solvent material balance. No knowledge of proprietary process information would be required for enforcement, and monitoring and recordkeeping would be simplified. Consequently, the mass balance format of "kg VOC emissions per Mg solvent feed" was selected as the format for expressing the standards of performance for synthetic fiber production facilities.

Selection of Numerical Emission Limitations

The proposed standards would reduce emissions from a variety of fiber spinning processes that have a wide range of uncontrolled emission rates. Baseline emission rates range from about 14 kg to about 56 kg per Mg solvent feed. Emission rate differences are in large part due to the variation within post-spinning process stages. For example, in some fiber processes (such as acrylics) the washing stage extracts residual solvent from the fiber, thus reducing the amount of solvent available for emission to the atmosphere. Other fiber processes, such as those for cellulose acetate and some modacrylic fibers, do not use a wash step. Installation of controls necessary to comply with Alternative III (selected as the basis for the standards) would not eliminate the range of emission rates that are a consequence of the basic variations in each process. Rather, implementation of Alternative III on an industry-wide basis would still result in different emission rates (on a unit-of-emissions-per-unit-of-solvent-feed basis) for different fiber processes.

Application of Alternative III control technology to a variety of processes with a range of uncontrolled emission rates would first lead to consideration of

a unique numerical emission limitation for each affected facility characterized by a model plant. Each emission limit would then represent the lowest possible emission rate that could be achieved through application of best demonstrated technology by all fiber types that are represented by a particular model plant type. This approach was not used, however, for the following reasons.

Because the application of direct gas-phase measurement techniques for synthetic fiber plants is impractical and exorbitantly expensive, emission rates must be determined indirectly via solvent material balance of metered solvent-use profiles. Some fiber plants may normally manufacture more than one fiber type simultaneously using the same solvent and solvent recovery facilities. For example, a plant may produce acetate filament yarn, acetate filtration tow, and modacrylic fibers. These three fibers could be produced with the same solvent but with three different processes, which as discussed above, would likely emit solvent vapor at three different emission levels if they were controlled separately. However, a plant of this type would typically use a common solvent recovery system. (In fact, separate recovery systems on each line would be impractical and quite expensive.) The solvent returned to the process lines for reuse, as well as makeup solvent introduced to replace solvent loss during processing, would thus come from a common source of supply.

These characteristics make it impossible to determine emissions from each process line independently. While the amounts of recovered and makeup solvent could be determined for the combination of lines, emissions could not be determined for each line producing a different fiber type independently, unless the remaining production lines were shut down for the period of a performance test. Because of the fluctuation in solvent inventory within the affected facility at any given point in time, several weeks of test data would be necessary to account for this variability in determining VOC emissions. Shutting down production for the lines not being tested for this length of time would constitute an unreasonable economic burden.

An alternative approach would be to divide the industry so that all affected facilities within a given group or subcategory are subject to the same emission limitation. Therefore, determination of compliance by material balance would be possible. Examination of the model plant parameters and

emission rates achievable under Alternative III reveal that two basic groupings may be identified of fiber type: (1) Acrylic fibers, and (2) all other fiber types. In addition to exhibiting different emission rates than other fiber types, acrylic fibers production facilities would not typically combine widely different process lines a single affected facility. An acrylic production facility may devote one or more lines to the production of some types of modacrylic fiber; however, the processes would be basically the same, given current industry practice, and would have similar VOC emission rates. Data obtained from an acrylic fiber plant that also produces modacrylic fibers using basically the same processing equipment as in acrylic fiber production indicates that plants producing both acrylic and modacrylic fibers with the same affected facility would be able to achieve the emission level for acrylic fiber production even while producing the modacrylic fibers. For these reasons a separate emission limit was selected for acrylic fiber production facilities.

EPA gathered process and emissions data from about 20 fiber producing facilities in developing its technical data base. EPA testing programs were conducted at two acrylic fiber plants in order to evaluate uncontrolled emission rates at various process points as well as to verify capture and control device efficiencies. Existing baseline emission rates were found to range from about 14 kg to 56 kg of VOC per Mg of solvent use. Based on emission data gathered at an acrylic fiber plant operating with what EPA considers the best vapor capture system in the industry, and solvent-use and recovery data provided by that plant, a capture efficiency of over 90 percent was determined to be achievable by enclosures around various process emission points. Because they are completely enclosed, a capture efficiency of 100 percent could be expected for dryers. The emission test data combined with data submitted from four other plants also demonstrated that control device efficiencies of 98 percent are being achieved. Thus, on those points not served by primary recovery system, for example, spinning solution preparation, washing, crimping, drawing, etc., overall emission control of 88 percent could be expected (90 percent \times 98 percent = 88 percent). Since capture at dryers is essentially total, overall emission control and recovery efficiency would be 98 percent. However, since 94 to 97 percent of the solvent used in fiber production is already recovered from the spinning cell or cabinet by the

primary recovery system, the incremental effect of Alternative III is to raise the overall recovery to near 99 percent. Based on the uncontrolled emissions from the model plants, control of additional specific process steps in the wet and dry spinning of acrylic fibers would result in emission rates of 5 to 8 kg of VOC emissions per Mg of total solvent feed, respectively, on a long-term basis. Control of additional process steps in the manufacture of all other fiber types would result in controlled emission rates of 14 to 15 kg VOC emissions per Mg total solvent feed on a long-term basis.

Emission rates under Alternative III for acrylic fiber production facilities range from 5 to 8 kg of VOC per Mg of solvent used. To ensure that all acrylic fiber production facilities could achieve the proposed standard, the emission limit achievable under the worst case, 8 kg VOC per Mg of solvent feed, was selected.

All affected facilities producing nonacrylic fiber could be controlled by either of two technologies: installation of capture and control equipment to service emission sources not controlled under baseline conditions or use of plant air management. Emission rates of 14 to 15 kg VOC per Mg solvent feed can be achieved by using the enclosure method. As discussed under the section entitled, "Selection of Basis of the Proposed Standards," plant air management is the only technically feasible means of emission control for some fiber processes, such as cellulose acetate filament yarn processing. An emission rate of 14 kg VOC emissions per Mg solvent feed is achievable through the use of plant air management.

Enforcement of individual emission limits for different nonacrylic fiber processes is not possible, since an affected facility may contain more than one fiber process. Consequently, the least stringent Alternative III emission rate, 15 kg of VOC per Mg of solvent feed, was selected to ensure that any affected facility in this subcategory would technically be capable of meeting the standard regardless of the fiber being produced.

As discussed earlier in this section, it is reasonable to expect that facilities producing acrylic fiber may also produce some types of modacrylic fiber, using the same type of processing and emission control equipment and exhibiting the same VOC emission rate as they would without the modacrylic fiber. Normally, an acrylic fiber production facility would not likely be used to produce nonacrylic fiber other than modacrylic. Nevertheless, the

proposed standard for acrylic fiber production facilities would apply to facilities that produce both acrylic and any type of nonacrylic fiber, not just modacrylic. The purpose of this is to avoid providing an incentive for a plant owner to group one or more acrylic fiber lines with nonacrylic lines in an affected facility in order to be subject to a less stringent standard for the acrylic line than if it were grouped with other acrylic lines.

The emission values (8 kg for acrylic and 15 kg for nonacrylic) represent the overall long-term levels that would be achieved with the installation of the best system of emission reduction. No allowance has been made for normal variation in emission levels or solvent losses. The deviation of individual performance test results from the long-term average will vary inversely with the duration of the test period. The longer the performance test period, the less each individual emission determination will deviate from the long-term average emissions. For this reason, selection of a specific time period for the performance test establishes the normal variation in emission determinations that is to be expected for that performance test period.

Statistical analysis of monthly emission values representative of Alternative III emission levels, which were derived indirectly from data on solvent measures from several synthetic fiber plants, indicates a significant month-to-month emission variation. No obvious temporal pattern in the data was observed, nor could it be concluded that any of the variations were the result of improper operation and maintenance. With a monthly performance test period, an allowance could be added to Alternative III levels to account for the maximum monthly emission variability. However, the allowance would necessarily be so large that if a facility were able to reduce consistently its monthly emission variability, the facility's long-term emissions would be permitted to exceed the long-term level achievable under Alternative III, while at the same time meeting the adjusted short-term limit.

A 6-month rolling average (a rolling average of the single monthly averages for 6 consecutive months) was also evaluated. Comparing the single monthly averages with 6-month rolling averages shows that the deviation from the long-term mean of any 6-month average value is considerably less than the deviation of a single month value. The 6-month rolling average was selected as the performance test period

that would limit emissions consistent with Alternative III, since it reduces significantly the expected variability while at the same time allowing a monthly check on emission levels. EPA's analysis indicated that for a 6-month rolling average, a value of 2 kg VOC per Mg solvent feed should be added to the Alternative III long-term emission levels to compensate for normal variation.

The proposed standards, therefore, would require acrylic fiber production facilities to meet a limit of 10 kg VOC (the sum of 8 kg plus the 2 kg allowance for variability) emissions per Mg of solvent feed. Affected facilities producing other fiber types would be required to meet a limit of 17 kg VOC (the sum of 15 kg plus the 2 kg allowance for variability) emissions per Mg of solvent feed.

Modification/Reconstruction Considerations

Modification, as defined in 40 CFR 60.14, occurs when any physical or operational change to an existing facility results in an increase in the emission rate to the atmosphere of any pollutant to which a standard applies. Since new source performance standards apply to existing facilities that become affected facilities through modification, EPA evaluated the potential for adverse impacts of the proposed standards on modified facilities. The evaluation indicated that retrofitting a modified facility with the emission control technology on which the standards are based would, at least in some cases, be technically difficult and may be exorbitantly expensive, and that no generally applicable alternative control technology is available. EPA's evaluation also indicated, however, that no modifications are likely to occur in the foreseeable future. This is because process changes and capacity increases that might occur at existing facilities either would not increase emissions or would be exempt under 40 CFR 60.14(e)(1) through (6), thus not falling under the definition of modification. Since no modifications are expected, EPA decided not to conduct any further impact analyses for modified facilities, but instead to apply the proposed standards only to newly constructed and reconstructed facilities, and exempt modified facilities. This exemption of modified facilities will be reconsidered during the 4-year review of the standards to determine if it should be continued.

Reconstruction, as defined in 40 CFR 60.15, occurs when the fixed capital cost of replacement components of an existing facility exceeds 50 percent of the fixed capital cost that would be

required to construct a comparable entirely new facility, and it is technically and economically feasible to meet the applicable standards. After receiving notice from the owner or operator as required under 40 CFR 60.15(d), the Administrator will determine whether the proposed replacement constitutes a reconstruction. In accordance with 40 CFR 60.15(f), the Administrator's decision is based upon the following: (1) The fixed capital cost of the replacement components, (2) the estimated life of the facility, (3) the extent to which the components being replaced cause or contribute to the emissions from the facility, and (4) any economic or technical limitations on compliance that are inherent in the proposed replacements. Repair or rebuilding of an existing facility where costs would exceed 50 percent of the cost of replacing the facility would be unusual in the synthetic fibers industry.

Performance Test Methods

As discussed in previous sections of this notice, direct measurement of gaseous VOC emissions at synthetic fiber production facilities is an expensive and complicated process because of the many emission points, and potential for large amounts of fugitive VOC emissions. Therefore, the proposed performance test procedures do not require direct gas-phase measurement of VOC emission. Instead, the procedures depend on a material balance to determine VOC emissions. The material balance is based on two facts. (1) Solvent can be lost from the process by only two routes: into the air (i.e., air pollutant emissions) or not into the air (nongaseous solvent losses); solvent loss minus nongaseous loss equals (solvent) VOC emissions. (2) Virgin solvent is fed to the affected facility to compensate or make up for the solvent that is lost from within the facility during normal operation. Makeup solvent, however, does not necessarily equal solvent losses. Within an affected facility there is a finite amount of solvent contained in the tanks and pipes at any given time. This solvent inventory varies continuously, reflecting both losses from, and additions to, the system. Therefore, in relating makeup solvent to total solvent losses, an accounting must be made for solvent inventory variation. Total solvent losses equal makeup solvent plus solvent inventory change. Thus, the ability to accurately determine solvent makeup, solvent inventory, and nongaseous solvent losses allows the VOC emissions to be calculated:

VOC Emission=Makeup Solvent—
Nongaseous Solvent Losses—Solvent
Inventory Variation

Makeup. Makeup solvent is the virgin solvent added to the affected facility to compensate for solvent lost during manufacture of the fibers. The proposed performance test procedures require that the amount of makeup solvent introduced to the affected facility be measured and recorded each calendar month.

Nongaseous losses. The term nongaseous losses means solvent losses from the process that are not released into the air. Nongaseous losses may occur as a result of disposing of or cleaning used filtration media, through runoff of excess fiber lubricant applied at the exit of the spin cell, as part of the steam condensate during crimping and heating operations, as residual solvent in the product, and as hydrolysis products during distillation of crude solvent/water solution. Data from several fiber plants indicate that these losses range from 6 to 13 kg per Mg of solvent feed, with most plants in the 10 to 13 kg range.

There are two alternatives for providing an allowance for nongaseous losses in the performance test procedure. These losses could either be determined separately for each affected facility by the owner or operator, or a constant value could be assigned that would be used for all affected facilities. Determining nongaseous losses for each affected facility would be expensive and would involve analysis of solvent content in the process streams, product, and any other places where nongaseous losses could occur. Some of this information is considered highly proprietary by producers. For example, residual solvent content in the fiber is controlled, in some cases, to a predetermined specification to obtain desired fiber characteristics. The other alternative of assigning a constant value that would be used in all cases is considered more reasonable. The data indicate that the variation from plant to plant is not extreme, and new facilities could be expected to exhibit values within the range found. Therefore, the proposed performance test procedure assigns a value of 13 kg per Mg of solvent feed to be used in calculating emissions at all affected facilities. Although unlikely, it is possible that a greater nongaseous loss might occur. To accommodate this possibility, an owner or operator would be allowed to use a higher value if it could be demonstrated to the Administrator that greater nongaseous losses occur at a particular affected facility.

Solvent inventory variation. The term solvent inventory refers to the amount of solvent contained in an affected facility at any given time. The majority of the solvent is contained in two locations. One is the solvent feed holding tank at the beginning of the process; this tank contains both recovered solvent and virgin makeup solvent. The other location is the crude solvent/water holding tank that precedes the solvent recovery distillation units; this tank contains the solvent that was used in processing the fiber, and captured for re-use. If no accounting is made for solvent inventory variation, erroneous calculated values for VOC emissions result.

There are two means for obtaining the values for solvent inventory variation. One would be to require the owner or operator of each affected facility to determine the values during each performance test period. The second would be to develop an appropriate industry-wide allowance as was done for nongaseous losses. It is EPA's judgment that the more direct and site-specific method should be required because the material balance emission determination is directly dependent on accurate knowledge of the amount of solvent contained within the facility. Thus, the owner or operator of each affected facility would be required to determine and record the solvent inventory variation for the facility on a monthly basis. Nearly all fiber producers currently measure solvent inventory routinely. The determination must include the total amount of solvent contained in all tanks and pipes within the affected facility, in order to account for the inventory change in the crude solvent/water solution holding tank and solvent feed holding tank during the averaging period. This data will permit an accurate calculation of monthly solvent loss.

Solvent feed. The format of the proposed standards is in terms of the ratio of VOC emissions to total solvent feed used in the process. The term total solvent feed refers to the amount of solvent used to dissolve the polymer and formulate the precipitation bath, in the case of wet spinning. The proposed test procedures allow solvent feed to be determined by one of the following three ways: (1) By direct measurement; (2) by measuring the amount of recovered solvent returned to the solvent feed holding tank and the makeup solvent. (The solvent feed equals the sum of makeup solvent and recovered solvent corrected for inventory change in the solvent feed holding tank.); (3) from plant records of the amount of polymer

feed and the solvent-to-polymer ratio of each spinning solution. Each of these three methods would yield an accurate determination of the amount of solvent feed to be used in the equation for determining VOC emissions.

Performance test. As discussed in the section entitled "Selection of Numerical Emission Limitations," a 6-month rolling average was selected as the performance test averaging period. Each of the values to be used in the equation for determining VOC emissions would represent calendar month measurements or determinations. Shorter and longer time periods were considered, but 1 month was judged most appropriate primarily because of the solvent inventory variation discussed earlier. The shorter the time period over which emissions are calculated, the greater the effect of solvent inventory variation. Data from several plants indicate that solvent inventory variation will almost certainly exceed the amount of makeup solvent on a daily or weekly basis. At the other extreme, the variation on a yearly basis would be negligible. Between these two extremes of a significant variation and a negligible variation is a monthly period for which the 5 years of data show that solvent inventory exceeds the amount of makeup solvent only about 10 percent of the time. This time period for determining emissions is attractive because monitoring and enforcement could be conducted on a relatively short-term basis, reducing the possibility of undetected long-term violations of the proposed standards. For these reasons, 1 month is selected as the time period over which emissions would be determined.

In summary, the following procedure is used to determine emissions per Mg of solvent feed. The amount of makeup solvent added during a given month is divided by the total amount of solvent feed measured during the same period. The resulting value if multiplied by 1,000 to arrive at a number that will represent solvent losses *per Mg*.

Nongaseous losses must be detected, since this type of loss does not reflect solvent emissions. The value chosen to represent nongaseous losses, 13 kg/Mg, is subtracted from the number calculated in the paragraph above. Similarly, the solvent inventory variation is also subtracted, since it does not reflect actual VOC emissions. The value for inventory variation is calculated by subtracting the beginning solvent inventory from the ending inventory (and indicating whether positive or negative) and dividing the difference by the amount of solvent feed

measured during the month. This resulting value is then multiplied by 1,000 to arrive at a number that will represent variation *per Mg* of solvent feed. This number is then subtracted from the value for solvent losses per Mg to arrive at the monthly VOC emissions per Mg.

Each monthly value for VOC emissions would be averaged with the values for the preceding 5 months. Thus, each month there would be a 6-month average of VOC emissions that would be compared to the proposed emission limits to determine compliance.

Selection of Monitoring and Recordkeeping Requirements

The proposed standards would require owners or operators to do one of the following: (1) Install, calibrate, maintain, and operate monitoring devices that continuously measure and permanently record the amount of makeup solvent introduced into the affected facility, and one of the following: the total amount of solvent used to dissolve the polymer (and solvent fed to the precipitation bath where applicable), or the amount of solvent recovered for reuse; or (2) install, calibrate, maintain, and operate monitoring devices that continuously measure and permanently record the amount of make-up solvent introduced into the affected facility and record the monthly use of polymer and the solvent-to-polymer ratio(s) used in preparation of the spinning solution(s).

The continuous solvent flow monitors that would be required are commercially available and are already in use at some plants. Installation and operation of these continuous solvent flow monitors requires the same level of skill or experience as other instrumentation used at existing synthetic fiber manufacturing facilities. The installed capital cost of the totalizing flow meters is about \$5,000 per unit.

The measured values are volumetric flow, and are converted to weight measurements by multiplying the volume times the density of the solvent in use. Also, since some solvent streams may contain nonsolvent fractions, the weight measurement is multiplied by the fraction of the flow that is actual solvent. While temperature will also affect the readings, it was determined that the temperature-induced variations are less than 1 percent over the expected operating range and are not considered significant.

The records that would be required under the second choice are already kept at all existing plants and would impose on additional burden on affected facility owners or operators.

Impacts of Reporting Requirements

An analysis was conducted of the impacts of reporting and recordkeeping requirements of the proposed standards and the General Provisions of 40 CFR Part 60. Included in the analysis are the rationale for the evaluation of the major alternatives considered prior to the selection of the proposed requirements, and a description of the information required by the General Provisions and by the proposed standards. A copy of the reports impact analysis is included in Subcategory II-I of EPA Docket No. A-80-7.

The recommended standards would require two types of reports, notification requirements that would enable the Agency to keep abreast of facilities subject to the standards, and reporting of results of the initial performance test. Owners or operators would be required to maintain records for 2 years on the process parameters that must be monitored.

The collection and maintenance of accurate data is essential for determining compliance with the standards. The data provides enforcement authorities with a historical record on the performance of a particular affected facility. Solvent-use data are already collected, at least in part, by several manufacturers for process reasons. These solvent-use data are taken from continuous recording flow meters on a monthly basis and used to calculate the solvent recovery for the previous month.

Based on the reports impact analysis, a total of 0.4 industry person-years would be required to comply with the recordkeeping and reporting requirements through the first 5 years of applicability. The Agency considers these impacts reasonable.

The Paperwork Reduction Act of 1980 (Pub. L. 96-511) requires clearance from the Office of Management and Budget (OMB) of certain public reporting/recordkeeping requirements before this rulemaking can be promulgated as final. This rulemaking does not involve a "collection of information" as defined in the 1980 Act. Therefore, the provisions of the Paperwork Reduction Act applicable to collection of information do not apply to this rulemaking.

Public Hearing

A public hearing will be held, if requested, to discuss the proposed standards in accordance with Section 307(d)(5) of the Clean Air Act. Persons wishing to make oral presentations should contact EPA at the address given in the Addresses section of this preamble. Oral presentations will be

limited to 15 minutes each. Any member of the public may file a written statement before, during, or within 30 days after the hearing. Written statements should be addressed to the Central Docket Section address given in the Addresses section of this preamble.

A verbatim transcript of the hearing and written statements will be available for public inspection and copying during normal working hours at EPA's Central Docket Section in Washington, D.C. (See **ADDRESSES** section of this preamble.)

Docket

The docket is an organized and complete file of information submitted to or otherwise considered in the development of this proposed rulemaking. The principal purposes of the docket are: (1) To allow interested parties to readily identify and locate documents so that they can participate in the rulemaking process; and (2) to serve as the record in case of judicial review except as noted in Section 307(d)(7)(A).

Miscellaneous

As prescribed by Section 111, establishment of standards of performance for solvent-spun synthetic fiber production plants was preceded by the Administrator's determination (40 CFR 60.16, 44 FR 49222, dated August 21, 1979) that these sources contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare. In accordance with Section 117 of the Act, publication of this standard was preceded by consultation with appropriate advisory committees, independent experts, and Federal departments and agencies. The Administrator will welcome comments on all aspects of the proposed regulation, including economic and technological issues, and monitoring requirements.

In addition, the Administrator specifically invites comments concerning the reporting requirements of the proposed standards. Any comment submitted to the Administrator should contain specific information and data pertinent to an evaluation of the magnitude and severity of any adverse impact and should suggest alternative courses of action to avoid this impact. Recommended alternative reporting requirements should contain complete instructions and should state all the reasons why the recommended requirements would be considered an improvement.

This regulation will be reviewed 4 years from the date of promulgation as required by the Clean Air Act. This

review will include an assessment of such factors as the need for integration with other programs, the existence of alternative methods, enforceability, emission control technology improvements, and reporting requirements.

Section 317 of the Clean Air Act requires the Administrator to prepare an economic impact assessment for any new source standard of performance under Section 111(b) of the Act. An economic impact assessment was prepared for the proposed regulations and for other regulatory alternatives. All aspects of the assessment were considered when the proposed standards were formulated to ensure that they would represent the best system of emission reduction, considering costs. The economic impact assessment is included in the background information document.

Comparisons of annualized costs per megagram of emission reduction were made for plants typical of those that are most likely to be built in the next 5 years. All three regulatory alternatives were examined. Compared to the baseline, Alternatives II and III result in emission reductions of 5.9 and 8.9 Gg per year, respectively, by 1987. Using these emission reduction figures, annualized costs per megagram of emission reduction of typical plants would be as much as \$400 and \$200, respectively, for Alternatives II and III.

At these same plants, Alternative III would result in an annual emission reduction of 3.0 Gg per year more than Alternative II. Alternative III would have an annualized cost of \$2.4 million more than Alternative II; however, the value of the additional solvent recovered would decrease the annualized cost by roughly the same amount. Thus, there would be no net annualized cost per Mg of emission reduction to the industry in implementing Alternative III over Alternative II. These costs (savings) do not include lost opportunity costs (i.e., the profit or return on investment which could be derived by investing in other than air pollution control equipment).

Under Executive Order 12291, EPA must judge whether a regulation is "major" and therefore subject to the requirement of a Regulatory Impact Analysis. This regulation is not major because it would result in none of the adverse economic effects set forth in Section 1 of the Order as grounds for finding a regulation to be major. The industry-wide annualized costs in the fifth year after the standards would go into effect would be as much as \$7.4 million. When compared with the \$8.2 million in savings resulting from

improved solvent recovery, there is a net annualized cost of \$1.2 million. There would be less than 1.7 percent price increase associated with the proposed standards. The economic analysis of the proposed standards' effects on the industry did not indicate any significant adverse effects on competition, investment, productivity, employment, innovation, or the ability of U.S. firms to compete with foreign firms.

This regulation was submitted to the Office of Management and Budget (OMB) for review as required by Executive Order 12291.

Pursuant to the provisions of 5 U.S.C. 605(b), I hereby certify that this rule, if promulgated, will not have a significant economic impact on a substantial number of small entities because there would be no small entities affected.

List of Subjects in 40 CFR Part 60.

Air pollution control, Aluminum, Ammonium sulfate plants, Cement industry, Coal, Copper, Electric power plants, Glass and glass products, Grains, Intergovernmental relations, Iron, Lead, Metals, Motor vehicles, Nitric acid plants, Paper and paper products industry, Petroleum, Phosphate, Sewage disposal, Steel, Sulfuric acid plants, Waste treatment and disposal, Zinc.

Dated: November 15, 1982.

Anne M. Gorsuch,
Administrator.

PART 60—[AMENDED]

It is proposed that 40 CFR Part 60 be amended by adding a new subpart as follows:

Subpart HHH—Standards of Performance for Synthetic Fiber Production Facilities

- Sec.
60.600 Applicability and designation of affected facility.
60.601 Definitions.
60.602 Standard for volatile organic compounds.
60.603 Performance test and compliance provisions.
60.604 Reporting requirements.

Authority: Sec. 111 and 301(a) of the Clean Air Act, as amended, (42 U.S.C. 7411, 7601(a)), and additional authority as noted below.

Subpart HHH—Standards of Performance for Synthetic Fiber Production Facilities

§ 60.600 Applicability and designation of affected facility.

(a) Except as provided in paragraph (b) of this section, the affected facility to which the provisions of this subpart apply is each solvent-spun synthetic fiber process that produces more than 500 megagrams of fiber per year.

(b) The provisions of this subpart do not apply to any facility that uses the reaction spinning process to produce spandex fiber or the viscose process to produce rayon fiber.

(c) The provisions of this subpart apply to each facility as identified in paragraph (a) of this section and that commences construction or reconstruction after _____ (date of publication in the Federal Register). The provisions of this subpart do not apply to facilities that commence modification but not reconstruction after _____ (date of publication in the Federal Register).

§ 60.601 Definitions.

(a) All terms that are used in this subpart and are not defined below are given the same meaning as in the Act and in Subpart A of this part.

"Acrylic fiber" means a manufactured synthetic fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85 percent by weight of acrylonitrile units.

"Makeup solvent" means the solvent introduced into the affected facility that compensates for solvent lost from the affected facility during them manufacturing process.

"Nongaseous losses" means the solvent that is not volatilized during fiber production, and that escapes the process and is unavailable for recovery, or is in a form or concentration unsuitable for economical recovery.

"Polymer" means any of the natural or synthetic compounds of usually high molecular weight that consist of many repeated links, each link being a relatively light and simple molecule.

"Precipitation bath" means the water, solvent, or other chemical bath into which the polymer or prepolymer (partially reacted material) solution is extruded, and that causes physical or chemical changes to occur in the extruded solution to result in a semi-hardened polymeric fiber.

"Rayon fiber" means a manufactured fiber composed of regenerated cellulose, as well as manufactured fibers composed of regenerated cellulose in which substituents have replaced not more than 15 percent of the hydrogens of the hydroxyl groups.

"Reaction spinning process" means the fiber-forming process where a prepolymer is extruded into a fluid medium and solidification takes place by chemical reaction to form the final polymeric material.

"Recovered solvent" means the solvent captured from liquid and gaseous process streams that is

concentrated in a control device and that may be purified for reuse.

"Solvent feed" means the solvent introduced into the spinning solution preparation system or precipitation bath. This feed stream includes the combination of recovered solvent and makeup solvent.

"Solvent inventory variation" means the normal changes in the total amount of solvent contained in the affected facility.

"Solvent recovery system" means the equipment associated with capture, transportation, collection, concentration, and purification of organic solvents. It may include enclosures, hoods, ducting, piping, scrubbers, condensers, carbon adsorbers, distillation equipment, and associated storage vessels.

"Solvent-spun synthetic fiber" means any synthetic fiber produced by a process that uses an organic solvent in the spinning solution, the precipitation bath, or processing of the spun fiber.

"Solvent-spun synthetic fiber process" means the total of all equipment having a common spinning solution preparation system or a common solvent recovery system, and that is used in the manufacture of solvent-spun synthetic fiber. It includes spinning solution preparation, spinning, fiber processing and solvent recovery, but does not include the polymer production equipment.

"Spandex fiber" means a manufactured fiber in which the fiber-forming substance is a long chain synthetic polymer comprised of at least 85 percent of a segmented polyurethane.

"Spinning solution" means the mixture of polymer, prepolymer, or copolymer and additives dissolved in solvent. The solution is prepared at a viscosity and solvent-to-polymer ratio that is suitable for extrusion into fibers.

"Spinning solution preparation system" means the equipment used to prepare spinning solutions; the system includes equipment for mixing, filtering, blending, and storage of the spinning solutions.

"Synthetic fiber" means any fiber composed partially or entirely of materials made by chemical synthesis, or made partially or entirely from chemically-modified naturally-occurring materials.

"Viscose process" means the fiber forming process where cellulose and concentrated caustic soda are reacted to form soda or alkali cellulose. This reacts with carbon disulfide to form sodium cellulose xanthate, which is then

dissolved in a solution of caustic soda. After ripening, the solution is spun into an acid coagulating bath. This precipitates the cellulose in the form of a regenerated cellulose filament.

§ 60.602 Standard for volatile organic compounds.

(a) On and after the date on which the initial performance test required to be conducted by § 60.8 is completed, no owner or operator subject to the provisions of this subpart shall cause the discharge into the atmosphere from any affected facility that produces acrylic fibers, VOC emissions that exceed 10 kilograms (kg) VOC per megagram (Mg) solvent feed to the spinning solution preparation system or precipitation bath. VOC emissions from affected facilities that produce only nonacrylic fiber types shall not exceed 10 kg VOC per Mg solvent feed. VOC emissions from affected facilities that produce only nonacrylic fiber types shall not exceed 17 kg VOC per Mg solvent feed. Compliance with the emission limitations is determined on a 6-month rolling average basis as described in § 60.603.

§ 60.603 Performance test and compliance provisions.

(a) Section 60.8(f) does not apply to the performance test procedures required by this subpart.

(b) Each owner or operator of an affected facility shall determine compliance with the applicable standard in § 60.602(a) by determining and recording monthly the VOC emissions per Mg solvent feed from each affected facility for the current and preceding 5 consecutive calendar months and using these values to calculate the 6-month average emissions. Each calculation is considered a performance test. The owner or operator of an affected facility shall use the following procedure to determine VOC emissions for each calendar month:

(1) Install, calibrate, maintain, and operate monitoring devices that continuously measure and permanently record for each calendar month the amount of makeup solvent and solvent feed. These values shall be used in calculating VOC emissions according to paragraph (b)(2) of this section. All monitoring devices, meters, and peripheral equipment shall be calibrated and any error recorded. Total compounded error of the flow measuring and recording devices shall not exceed 1 percent accuracy over the operating

range. As an alternative to measuring solvent feed, the owner or operator may:

(i) Measure the amount of recovered solvent returned to the solvent feed storage tanks, and use the following equation to determine the amount of solvent feed:

Solvent Feed = Makeup Solvent + Recovered Solvent + Change in the Amount of Solvent Contained in the Solvent Feed Holding Tank.

(ii) Measure and record the amount of polymer introduced into the affected facility and the solvent-to-polymer ratio of the spinning solutions, and use the following equation to determine the amount of solvent feed:

$$\text{Solvent Feed} = \sum_{i=1}^n (\text{Polymer Used})_i \times (\text{Solvent-to-Polymer Ratio})_i$$

where subscript "i" denotes each particular spinning solution used during the test period; values of "i" vary from one to the total number of spinning solutions, "n," used during the calendar month.

(2) VOC emissions shall be determined each calendar month by use of the following equations:

$$E = \frac{M_w}{S_v} - N - I \quad \text{and} \quad M_w = M_v S_p D$$

$$S_w = \frac{S_v S_p D}{1000} \quad I = \frac{I_2 - I_1}{S_w}$$

where all values are for the calendar month only and where

E = Emissions in Kg per Mg solvent feed;
 S_v = Measured or calculated volume of solvent feed in liters;
 S_w = Weight of solvent feed in Mg;
 M_v = Measured volume of makeup solvent in liters;
 M_w = Weight of makeup in Kg;
 N = Allowance for nongaseous losses per Mg solvent feed; (13 Kg/Mg);
 S_p = Fraction of measured volume that is actual solvent (excludes water);
 D = Density of the solvent in Kg/liter;
 I = Allowance for solvent inventory variation or changes in the amount of solvent contained in the affected facility per Mg solvent feed (may be positive or negative);
 I_1 = Amount in Kg of solvent contained in the affected facility at the beginning of test period, as determined by owner or operator;

I_s = Amount in Kg of solvent contained in the affected facility at the close of test period, as determined by owner or operator.

(i) N, as used in the equation in paragraph (b)(2) of this section, equals 13 Kg per Mg solvent feed to the spinning solution preparation system and precipitation bath. This value shall be used in all cases unless an owner or operator demonstrates to the satisfaction of the Administrator that greater nongaseous losses occur at the affected facility. In this case, the greater

value may be substituted in the equation.

§ 60.604 Reporting requirements.

(a) The reporting requirements of § 60.8(a) apply only to the initial performance test.

(b) Solvent-spun synthetic fiber producing facilities exempted from these standards in § 60.600(a) (those producing less than 500 megagrams annually) shall report to the Administrator within 30 days whenever extruded fiber for the preceding 12

calendar months exceeds 500 megagrams.

Note: This regulation does not involve a "collection of information" as defined under the Paperwork Reduction Act of 1980 (Pub. L. 96-511). Therefore, the provisions of the Paperwork Reduction Act applicable to collections of information do not apply to this regulation.

(Sec. 114 of the Clean Air Act as amended (42 U.S.C. 7414).)

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