United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

EPA-450/3-85-029b
July 1988

Air

EPA

Magnetic Tape Manufacturing Industry — Background Information For Promulgated Standards

Final
EIS

NSPS

EPA 450/3-85-029b

Magnetic Tape Manufacturing Industry — Background Information For Promulgated Standards

Emission Standards Division

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

July 1988

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ENVIRONMENTAL PROTECTION AGENCY

Background Information
and Final
Environmental Impact Statement
for the Magnetic Tape Manufacturing Industry

Prepared by:

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9/16/88
(Date)

1. The promulgated standards of performance will limit emissions of volatile organic compounds (VOC) from new, modified, and reconstructed facilities that manufacture magnetic tape. Section 111 of the Clean Air Act (42 U.S.C. 7411), as amended, directs the Administrator to establish standards of performance for any category of new stationary source of air pollution that ". . . causes or contributes significantly to air pollution which may reasonably be anticipated to endanger public health or welfare."

2. Copies of this document have been sent to the following Federal Departments: Labor, Health and Human Services, Defense, Transportation, Agriculture, Commerce, and Interior; the National Science Foundation; the Council on Environmental Quality; State and Territorial Air Pollution Program Administrators; EPA Regional Administrators; Association of Local Air Pollution Control Officials; Office of Management and Budget; and other interested parties.

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1. SUMMARY

On January 22, 1986, the Environmental Protection Agency (EPA) proposed new source performance standards (NSPS) for magnetic tape manufacturing facilities (51 FR 2996) under authority of Section 111 of the Clean Air Act. Public comments were requested on the proposal in the Federal Register. One trade association and 14 representatives from 11 companies commented on the proposed NSPS. Additional information relevant to the issues raised by the commenters was sought and obtained from industry, process and control equipment vendors, and local regulatory agencies. This information was incorporated into the Agency's responses to the comments. The comments and responses are summarized in this document. The summary of comments and responses and the additional information contained in the docket that was gathered to supplement and verify the assertions made by the commenters serve as the basis for the revisions made to the standards between proposal and promulgation.

1.1 SUMMARY OF CHANGES SINCE PROPOSAL

In response to public comments and as a result of EPA reevaluation, changes have been made in the proposed standards. Significant changes are summarized below. All changes that have been made to the regulation are explained fully in the responses to the comments.

Changes were made in the level of control required by the standards. A new survey of the plants in this industry indicated that the primary means of growth in this industry will be by modification and reconstruction of existing lines, not construction of new lines as previously predicted by the industry. A cost analysis of modification scenarios at specific plants resulted in a change in the level of control required by the standard for modified and reconstructed coating operations and for most mix equipment. If an existing coating operation can be

demonstrated to achieve a baseline level of control of 90 percent or better, the revised standard allows the coating operation to remain at the demonstrated level of control or 93 percent, whichever is lower, after it is modified or reconstructed. The 90 percent level of control can be demonstrated by a performance test or by the alternative means of compliance, the use of a total enclosure and a control device that is at least 92 percent efficient.

If the owner or operator of a modified or reconstructed coating operation subsequently adds a new control device, the revised standard requires that the control device must be at least 95 percent efficient. In addition, the owner or operator must demonstrate that the overall level of control determined prior to installation of the new control device is still being achieved. If this demonstration shows that a higher overall efficiency is being achieved with the new control device than was previously demonstrated, then the coating operation must continue to meet either this higher level of control or 93 percent, whichever is lower.

New coating operations and existing coating operations with a baseline control level below 90 percent before modification or reconstruction must meet the originally proposed standard of at least 93 percent control of the applied solvent. An annual solvent utilization cutoff of 370 cubic meters (m^3) (98,000 gallons [gal]) has been added for modified or reconstructed coating operations based on projected equipment needs for compliance at such facilities and the model line parameters and costs developed prior to proposal. The annual solvent utilization cutoff of 38 m^3 (10,000 gal) in the proposed standard has been retained for new coating operations. The basis for "annual solvent utilization" has been changed for clarification from a "12-month period" to a "calendar year."

The revised mix equipment standard requires the use of covers alone or covers with venting to a control device in the following three circumstances: (1) when mix equipment is modified or reconstructed; (2) when new mix equipment is installed without the concurrent construction of a new control device on a coating operation; and (3) when the control device that is constructed concurrently is a condenser. When new mix equipment is added during concurrent construction of a new control device (except

condensers) for emissions of volatile organic compounds (VOC) from a coating operation, covers that meet specific criteria and that are vented to a 95 percent efficient control device must be used. The wording of this standard has been modified to reflect more closely the practical application of best demonstrated technology (BDT) for this category of mix equipment. For this standard, "concurrent" means that the control device is constructed within 6 months before or 2 years after the installation of the new mix equipment.

The affected facility definition has been revised. In the proposed standards, the affected facility was defined as each coating operation with its associated mix equipment. This definition was selected because it achieved the highest level of mix room control at a reasonable cost for the proposed level of the standards. The standard recommended for promulgation contains separate affected facility definitions for each coating operation and each piece of mix equipment.

Several changes were made in the definitions and the compliance provisions. Industry representatives requested that EPA provide a definition of total enclosure by which they could determine compliance. Total enclosure requirements have been added to the regulation that limit the total area of the natural draft openings in the enclosure, that specify the minimum allowable distance between the openings and the sources of VOC, and that require the maintenance of an average face velocity of at least 3,600 meters per hour (m/h) (200 feet per minute [ft/min]) across the openings. These restrictions are necessary to ensure complete containment of the VOC emissions from the coating operation. However, flexibility has been maintained by allowing structures not meeting the requirements to be approved by the Administrator on a case-by-case basis. Test procedures and monitoring, recordkeeping, and reporting requirements for the use of total enclosures also have been added.

The provisions for demonstrating compliance with the coating operation standards by a monthly material balance (§ 60.713(b)(1)) have been revised to account for VOC that may be retained in the magnetic tape after oven drying. The quantity of retained solvent, RS_i, must be determined by the owner or operator by measurement techniques approved by the Administrator. The term "RS_i" has been included in Equation 1 and has

been defined in § 60.711. Other definitions also have been modified to clarify that the monthly material balance is intended to include the net VOC actually emitted from the coating operation in the gaseous phase. Thus, all VOC (including dilution solvent) added at any point in the process is to be included, and any VOC contained in waste coatings or retained in the final product can be subtracted.

One compliance option presented in the proposed magnetic tape NSPS allowed the use of a short-term gaseous emissions test to apportion the results of a long-term liquid material balance at plants with affected and nonaffected coating lines controlled by the same solvent recovery device. Although comments were requested on this compliance method at proposal, none were received. The EPA has since reviewed this method and determined that the variability in production and solvent use during a month is too great for gaseous proportions measured over a single short-term (3-hour) test period to be meaningful when applied to a 1-month solvent recovery value. Therefore, this test method has been withdrawn as a compliance method.

The compliance provisions have been revised to clarify their application to coating operations with permanent total enclosures. The test procedures provided in the regulation at proposal and retained in the final rule include the performance test option of measuring both capture efficiency and control device efficiency; the product of these two values is required to be at least 93 percent (or 90 percent for certain modified or reconstructed facilities). As proposed, this option might have been interpreted to allow the capture efficiency of a permanent total enclosure to be presumed to be 100 percent. However, it is doubtful that this theoretical capture efficiency is ever realized in practice, particularly when access doors occasionally must be opened. Therefore, this performance test procedure has been revised to require the measurement of capture efficiency whenever the procedure is used, even when a permanent enclosure is in place.

The alternative means of compliance in the proposed regulation, the demonstration that a total enclosure, which meets certain work practice and equipment requirements (or has been approved by the Administrator on a case-by-case basis), and a 95 percent efficient control device are in use,

has been retained in the final rule. Plants are expected to select this alternative means of compliance because it is easier and less costly than the performance test method.

The performance testing and monitoring provisions for fixed bed carbon adsorption systems have been revised to represent more accurately the performance of multibed systems. This revision was an indirect result of a public comment concerning the performance of fixed-bed carbon adsorbers. Performance tests are the direct means of determining the compliance status of an affected facility and serve as the basis for legal enforcement actions against noncomplying sources. In contrast, the monitoring devices required by these standards serve only as indicators of control device performance to aid enforcement agencies in targeting inspections and performance tests toward potential violators. The revised procedures will ensure that the performance test runs and monitoring averaging periods will parallel the complete adsorption cycles of the individual adsorber vessels or the system's complete sequential rotation through the adsorption cycles of all the vessels. Use of a testing or monitoring period that does not correspond to an integral number of actual adsorber vessel cycles or system rotations could bias the results slightly in either direction. Efficiencies would be biased high if the test run or monitoring period did not include the elevated emissions typical at the beginning and end of a vessel's adsorption cycle; efficiencies would be biased low if the period included a disproportionate number of these emission peaks.

The performance testing provisions for carbon adsorption systems included in the standards at proposal did not specifically index the test period to discrete adsorber vessel cycles or system rotations. Rather, each of the three requisite performance test runs was required to be a minimum of 30 minutes duration. While this requirement would have allowed the performance test runs to correspond to individual adsorber vessel cycles or system rotations that were at least 30 minutes in duration, it was not mandatory. Because adsorption cycles in different systems can range from several minutes to several hours, performance tests based only on 30-minute runs could be biased somewhat in either direction. The proposed performance testing provisions would have resulted in adequate

determinations of the performance of these systems, but the final provisions provide for improved accuracy.

The revised carbon adsorption system performance testing provisions include separate requirements for systems with a single common exhaust stack and for systems with individual stacks for each adsorber vessel. The Agency believes that a common exhaust stack allows simpler performance testing that is more representative of the entire system's performance but has included provisions for individual exhaust stacks because this is currently the more typical configuration.

For adsorption systems with a common exhaust stack serving all the adsorber vessels, the final performance testing provisions require that the system be tested as a whole. Three test runs are required; each run must correspond to one or more complete rotations through the sequential adsorption cycles of all the adsorber vessels.

For adsorption systems with individual exhaust stacks, the final performance testing provisions require that each adsorber vessel be tested individually. Three test runs are required for each vessel; each run must correspond to one or more complete adsorption cycles. A procedure has been added to the compliance provisions for computing a system efficiency from the individual adsorber vessel efficiencies.

The final performance testing provisions are likely to result in somewhat increased testing costs in the case of a multiple-bed system because each test run must include at least one cycle for each bed. However, this increased cost would be very small relative to the control system cost and is reasonable considering the increased accuracy that will result.

The final adsorber monitoring provisions parallel the final performance testing provisions. Again, separate provisions apply to systems with a common exhaust stack and those with individual stacks. No increase in monitoring costs is anticipated.

For adsorption systems with a common exhaust stack, a monitoring device must be installed on the common exhaust stack and one also may be installed on the common inlet duct. The owner or operator must report each occurrence when the average emission level or system efficiency (depending on whether the outlet only, or the inlet and outlet gas streams

are monitored) over three successive system rotations varies outside the specified range.

For adsorption systems with individual vessel exhaust stacks, a monitoring device must be installed on each individual exhaust stack, and a monitoring device also may be installed on the common inlet duct or on each individual inlet duct. Each adsorber vessel must be monitored for a minimum of one complete adsorption cycle per day. A 3-day rolling average emission level or efficiency for each vessel (depending on whether the outlet only, or the inlet and outlet gas streams are monitored) must be computed each day from the daily averages, and these 3-day rolling averages must be reported when they vary outside the specified ranges.

Commenters supplied new data on the minimum relief valve size requirements and the cost for the proposed standards requirement that all new solvent storage tanks be operated at a pressure of 103 kilopascals (15 pounds per square inch gauge) rather than at atmospheric pressure. The EPA verified these data, conducted a cost analysis, and concluded that no cost-effective method existed for controlling VOC emissions from storage tanks in this industry. The proposed standard for solvent storage tanks was withdrawn on November 25, 1986 (51 FR 42800).

Following a survey of all of the plants in the industry, EPA revised the 5-year growth projection from 21 new lines to 5 new and 11 modified lines. Of these 16 affected lines, 1 new line and 4 modified lines will not have to increase the level of control because they are either below the applicable annual solvent use cutoffs or above the baseline control cutoff for modified lines. The changes in environmental, energy, and economic impacts that result from the revised growth projection are described in Section 1.2.

The reporting requirements of the magnetic tape NSPS also have been revised. The regulation at proposal required semiannual reporting of months of noncompliance and of all 3-hour periods when monitor values exceeded the allowable variations. The revised regulation now requires quarterly reporting of these events and semiannual reporting of months of compliance and acceptable monitored values. This semiannual report would include only a statement on the status of the plant and would contain no data.

Other changes include the addition of Methods 18 and 25 as possible methods to determine VOC concentration and the addition of monitoring and reporting requirements for vapor capture systems that are not total enclosures. Minor changes have been made to the monitoring and reporting provisions for clarity and consistency with other VOC standards.

1.2 SUMMARY OF IMPACTS OF PROMULGATED ACTION

1.2.1 Alternatives to Promulgated Action

The regulatory alternatives for new lines are discussed in Chapter 6 of Volume I of the background information document (BID) for the proposed standards (EPA-450/3-85-029a). These regulatory alternatives reflect the different levels of emission control from which one was selected for new lines that represents the BDT considering costs, nonair quality health and environmental impacts, and economic impacts for magnetic tape manufacturing facilities. These alternatives remain the same for new lines.

For modified lines, cost analyses were performed for specific scenarios at specific plants. These analyses included different baseline control levels than those evaluated for new lines. The baseline control levels evaluated for modified lines were 83 percent, 88 percent, and 90 percent, all of which were analyzed relative to 93 percent control, the level of the proposed NSPS.

1.2.2 Environmental Impacts of Promulgated Action

The environmental impacts are discussed in Chapter 7 and Appendix E of the Volume I (or proposal) BID. Table 1-1 presents the environmental, energy, and economic impacts. The projected number of affected lines has decreased from 21 new lines to 5 new lines and 11 modified lines. One of the new lines and two of the modified lines will be below the applicable annual solvent use cutoffs, and two of the modified lines will be above the baseline control level cutoff; none of these lines would have to increase the level of VOC control. The required level of control has been lowered for all modified mix equipment and some modified coating operations. Therefore, all of the environmental, energy, and economic impacts have changed as described in this section and in Section 1.2.3 below.

The new and modified affected lines will be of several sizes. Of the projected 11 lines to be required to increase their level of control,

TABLE 1-1. ANNUAL IMPACTS OF THE REVISED NSPS

	Typical new model line[a]				
	Mix equipment[b]	Coating operation[b]	Total[b]	Baseline[c]	In the fifth year for all lines[d]
VOC emissions, Mg (ton)	3.5 (4)	44 (49)	47.5 (53)	179 (197)	960 (1,060)
Wastewater, m^3 (10^3 gal)	190 (50)	1,780 (470)	1,970 (520)	1,590 (420)	2,370 (625)
Solid waste, kg (lb)	55 (120)	770 (1,700)	825 (1,820)	700 (1,550)	800 (1,770)
Energy, TJ (10^6 Btu)	0.7 (650)	11.2 (10,600)	11.9 (11,250)	10.5 (10,000)	8.2 (7,770)
Annualized cost, $/yr	-39,700	18,900	-20,800	52,000	-32,000
Capital cost, $	4,700	1,607,200	1,611,900	1,580,000	3,014,000

[a]Typical model line is 0.66 m (26 in.) wide; assumes the affected lines will be controlled by a fixed-bed carbon adsorber.
[b]Absolute impacts of a single line operating in compliance with the revised NSPS.
[c]Normal level of control required by States, for a single typical line.
[d]Total increment above baseline for the 11 lines (4 new and 7 modified or reconstructed) of various sizes that will be required to reduce VOC emissions by 1991.

1 new and 3 modified or reconstructed lines are expected to be 0.33 meter (m) (13 inches [in.]) wide, and 3 new and 4 modified or reconstructed lines are expected to be 0.66 m (26 in.) wide (the "typical" production size discussed in this document). The environmental and economic impacts are reported as the annual impacts for typical new and modified or reconstructed lines and as the nationwide impact in the fifth year for all lines. The impacts are reported assuming all lines will be controlled by a carbon absorber, which results in the maximum estimate of impacts.

The estimated fifth-year VOC emission reduction achieved by the revised NSPS is 960 megagrams (Mg) (1,060 tons). The estimated emission reduction achieved by a typical new line is 131 Mg (144 tons) or 73 percent; that of a typical modified or reconstructed line is 92 Mg (101 tons) or about 51 percent. Nationwide emissions will be reduced by a total of about 60 percent in the fifth year of implementation. The estimated increase in wastewater from a typical new coating line is 380 m^3 (100,000 gal) (about 24 percent). The increase for a typical modified or reconstructed line is about 190 m^3 (50,000 gal) or 12 percent. The nationwide increase in fifth-year wastewater generation is expected to be 2,400 m^3 (625,000 gal), about 17 percent. The estimated increase in solid waste for a typical new coating line is 120 kilograms (kg) (270 pounds [lb]) (17 percent). A typical modified or reconstructed line is expected to increase solid waste generation by about 10 percent or 70 kg (150 lb). The estimated nationwide increase in solid waste in the fifth year is 800 kg (1,770 lb). This amounts to a 13 percent increase.

The secondary impacts of the revised NSPS on VOC in the wastewater and particulate matter, sulfur oxide, and nitrogen oxide emissions to the atmosphere from increased energy requirements will also be lower than estimated for the proposed NSPS. The estimated annual increase in waterborne VOC from a typical new coating line is about 23 percent or 35 kg (80 lb). The estimated annual increase in waterborne VOC from a typical modified or reconstructed line is about 11 percent or 20 kg (40 lb). The estimated total annual increase in fifth-year waterborne VOC levels is 225 kg (500 lb) or 16 percent. These estimates should be considered as highly tentative, however, since the actual increased levels of VOC in wastewaters will be determined by the permitting actions of

State and Federal regulatory officials charged with implementation of the Clean Water Act. Accordingly, inclusion in this document of the above estimated increases in future discharges of waterborne VOC does not constitute a legal determination that such discharges from point sources will comply with applicable water quality or technology based effluent standards. This judgment can only be made by the applicable local, State, or Federal regulatory officials on a case-by-case basis.

The estimated annual increase in total secondary air pollutants from a typical new coating line is 1.5 Mg (1.7 tons) (about 12 percent). A typical modified or reconstructed line is expected to increase these emissions by about 0.7 Mg (0.8 ton) (about 6 percent). The estimated total increase in secondary air pollutants in the fifth year is 9 Mg (10 tons) (about 8 percent).

Because the environmental impacts have changed from the Volume I BID, the Volume II (or promulgation) BID becomes the final Environmental Impact Statement for the promulgated standards.

1.2.3 Energy, Cost, and Economic Impacts of the Promulgated Action

The energy impacts of the proposed standards are presented in Chapter 7 of the Volume I BID. For the same reasons that the estimated environmental impacts of the revised standards decreased relative to the proposed standards, the estimated energy impacts also decreased. The energy impacts are presented in Table 1-1. The estimated fifth-year impact is about 8 terajoules (TJ) (7.8 billion British thermal units [Btu]) (9 percent). The estimated annual energy impact of a typical new coating line is about 1.3 TJ (1.3 billion Btu) (13 percent). (The appearance in Table 1-1 that the incremental impact of a typical new coating line is 1.4 TJ is the result of rounding error.) The annual energy impact of a typical modified or reconstructed line is expected to be about 0.6 TJ (610 million Btu) (6 percent).

The cost impacts of the proposed standards are presented in Chapter 8 of the Volume I BID. For the same reasons listed above in Section 1.2.2, the estimated cost impacts of the revised standards are different than those for the proposed standards. The estimated impacts are presented in Table 1-1.

It is now projected that four new coating lines will be constructed and subject to the emission reduction provisions of the NSPS during the next 5 years. Because the value of the solvents recovered by the control device will exceed the cost of operating the device, the annual operating cost of a typical new line after adjusting for solvent recovery will result in a net savings (or credit) of about $73,000 per line. With respect to a typical modified or reconstructed line, the annual control cost per line above the baseline is about $31,000. This estimate is based on contacts with industry and the model plant parameters and costs developed prior to proposal.

The nationwide annual cost of the NSPS at proposal in the fifth year of implementation was a net credit of approximately $777,000. Using the data presented above, the fifth-year annual cost of the revised NSPS is estimated to be a net credit of about $32,000. This relative increase in the fifth year annual cost estimates is due to the decrease in the number of new lines for which net credits for solvent recovery were obtainable and the number of modified lines for which the required additional control costs exceeded the additional savings obtained from solvent recovery.

The total capital control cost of a typical new line is about $1.6 million. That of a typical modified or reconstructed line is about $477,000. These represent increases over baseline control costs of $32,000 and $477,000, respectively.

The nationwide capital control cost of the NSPS at proposal in the fifth year of implementation was approximately $455,000. Using the data presented above, the fifth-year capital control cost of the revised NSPS is estimated to be about $3 million. The percent increase in fifth-year capital cost of the revised NSPS relative to baseline is about 52 percent.

The economic impacts of the proposed standards are presented in Chapter 9 of the Volume I BID. Those impacts are based on new magnetic tape manufacturing lines and are unchanged for the new lines now projected in the first 5 years. However, as discussed above, it is now expected that a number of affected facilities in the coming years will be modified or reconstructed lines. An analysis of modification scenarios submitted by industry resulted in revised economic impacts but no change in the conclusion that the economic impacts are negligible. The maximum retail

price increase under the modification scenarios analyzed is projected to be less than 0.5 percent.

1.2.4 Other Considerations

1.2.4.1 Irreversible and Irretrievable Commitment of Resources. Chapter 7 of the Volume I BID concluded that the slight increase in energy use of the proposed standard was insignificant relative to the total energy demand of the process equipment. The increase in energy demand of the revised standards is less than for the proposed standards, so the impact on resources is negligible.

1.2.4.2 Environmental and Energy Impacts of Delayed Standards. Chapter 7 of the Volume I BID concluded that there would be no energy or environmental benefit to delaying the proposed standards because the VOC emission reduction far outweighed the slight increase in energy use. This conclusion is still valid for the revised standards because the energy impact decreased more than the VOC emission reduction decreased.

1.2.4.3 Urban and Community Impacts. These standards will have a positive impact on urban areas and communities because of decreased VOC emissions. However, the VOC emission reduction achieved by the standards has decreased since proposal. There should be no decrease in employment in urban areas and communities because the revised economic analysis indicated that the standards would have little impact on retail price or profit.

2. SUMMARY OF PUBLIC COMMENTS

A total of 18 letters commenting on the proposed standards and the BID for the proposed standards were received. Comments from the public hearing on the proposed standards were recorded, and a transcript of the hearing was placed in the project docket. A list of commenters, their affiliations, and the EPA document number assigned to their correspondence is given in Table 2-1.

For the purpose of orderly presentation, the comments have been categorized under the following topics:

1. Level of the Standard
2. Best Demonstrated Technology (BDT)
3. Affected Facility and Modification and Reconstruction
4. Solvent Storage Tanks
5. Compliance Provisions
6. Reporting and Recordkeeping Requirements
7. Cost and Economic Assumptions and Impacts
8. Suspension of the Standards

The comments, the issues they address, and EPA's responses are discussed in the following sections of this chapter.

2.1 LEVEL OF THE STANDARD

2.1.1 Comment

Two commenters (IV-F-1 [Forbes], IV-D-5) said that EPA did not properly consider the normal process variability associated with carbon adsorbers in proposing a standard requiring 93 percent control of the coating operation. One commenter (IV-F-1 [Forbes]) reviewed the long-term operating data for three carbon adsorbers presented in Tables C-6 and C-8 of the Volume I BID and concluded that the standard deviation for all three systems exceeds 2 percent. According to this commenter, if the

TABLE 2-1. LIST OF COMMENTERS ON PROPOSED STANDARDS OF PERFORMANCE FOR MAGNETIC TAPE MANUFACTURING INDUSTRY

Docket item No.[a]	Commenter/affiliation
IV-D-1	K. C. Burton Facilities Manager General Products Division IBM Corp. Tucson, Arizona 85744
IV-D-2	E. I. du Pont de Nemours & Company, Inc. Chemicals and Pigments Department Technical Services Laboratory Chestnut Run Wilmington, Delaware 19898
IV-D-3	Mr. Robert Brothers Director, Regulatory Affairs Eastman Kodak Company 343 State Street Rochester, New York 14650
IV-D-4	Mr. Gregory Fischer Manager, Environment and Energy Memorex Corp. San Tomas at Central Expressway Santa Clara, California 95052
IV-D-5	Mr. Arne Carlson Director of Loss Control and Environmental Protection Graham Magnetics Inc. Subsidiary of Carlisle Corp. U.S. Highway 380 Graham, Texas 76046
IV-D-6	Mr. David W. Sorrelle Senior Chemical Engineering Specialist Sony Magnetic Products Inc. of America Highway 84 West Dothan, Alabama 36301
IV-D-8	Mr. Thomas W. Zosel Senior Environmental Specialist 3M Company Post Office Box 33331 St. Paul, Minnesota 55133

(continued)

TABLE 2-1. (continued)

Docket item No.[a]	Commenter/affiliation
IV-D-10	Mr. Richard H. Forbes Eastman Kodak Company Environmental Technical Services Health and Environment Laboratories 343 State Street Rochester, New York 14650
IV-D-13	Mr. William K. Haynes Environmental Coordinator Ampex Corp. Post Office Box 190 Opelika, Alabama 36802
IV-D-14	Mr. Thomas W. Zosel Senior Environmental Specialist 3M Company Post Office Box 33331 St. Paul, Minnesota 55133
IV-D-15	Mr. Arne Carlson Director of Loss Control and Environmental Protection Graham Magnetics, Inc. Subsidiary of Carlisle Corp. U.S. Highway 380 Graham, Texas 76046
IV-D-17	Mr. Victor E. Sower General Manager Tandy Magnetics 401 N.E. 38th Street Fort Worth, Texas 76106
IV-D-18	Mr. Thomas W. Zosel Senior Environmental Specialist 3M Company Post Office Box 33331 St. Paul, Minnesota 55133
IV-D-20	Mr. Gregory Fischer Manager, Environment and Energy Memorex Corp. San Tomas at Central Expressway Santa Clara, California 95052

(continued)

TABLE 2-1. (continued)

Docket item No.[a]	Commenter/affiliation
IV-D-21	Ms. Charlotte Hardaway General Products Division IBM Corp. Tucson, Arizona 85744
IV-D-28	Mr. Michael A. Brown Schmeltzer, Aptaker & Sheppard, P.C. Counselors at Law 1800 Massachusetts Avenue, NW Washington, D.C. 20036-1879 (Representing: International Tape/Disc Association 10 Columbus Circle, Suite 2270 New York, New York 10019)
IV-D-32	Mr. David R. Fritz Division Counsel Sony Corp. of America Sony Drive Park Ridge, New Jersey 07656
IV-E-61, 65, and 82	Mr. Arne Fladager Tandy Magnetic Media 1600 Memorex Drive Santa Clara, California 95050
IV-F-1	Transcript of Public Hearing on Proposed New Source Performance Standards for the Magnetic Tape Manufacturing Industry. Speakers were: Mr. Arne Carlson, Graham Magnetics, Inc. Mr. Gregory Fischer, Memorex Corp. Mr. Richard H. Forbes, Eastman Kodak Company Mr. William K. Haynes, Ampex Corp. Mr. Victor E. Sower, Tandy Magnetics Mr. Glenn Ford, Tandy Magnetic Media Mr. Thomas W. Zosel, 3M Company

[a]The docket number for this project is A-82-45. Dockets are on file at EPA Headquarters in Washington, D.C., and at the Office of Air Quality Planning and Standards in Durham, North Carolina.

long-term operational variability results in a normal distribution of monthly measurements, two-thirds of all results would be expected to be within plus or minus one standard deviation from the mean, and 95.5 percent of all results would fall within plus or minus two standard deviations from the mean. The commenter concluded that for a control system functioning at an average long-term efficiency of 95 percent and with a standard deviation of 2 percent, a point would be expected to fall below 91 percent about once every 4 years. If so, a 100 percent efficient capture device ducting emissions to a control device with a long-term average efficiency of 95 percent would be expected to fail the proposed standard of 93 percent control efficiency for each and every month at least once and possibly twice every year. The two commenters recommended that the standard be established at 90 percent for the coating operation in order to take process variability into account.

Response. The commenter is correct in stating that the standard deviations of the monthly efficiency data presented in Tables C-6 and C-8 of Volume I BID exceed 2 percent. The EPA undertook additional investigation into the circumstances of the reported efficiencies to determine if these variations were indeed the result of normal process variability.

The data in Table C-6 are from an IBM Corporation facility. A representative of IBM Corporation indicated that the first 4 months of data listed in Table C-6 (January through April 1982) coincide with the startup phase of both the carbon adsorber and the process equipment it serves.[1] These months should, therefore, be deleted from consideration of the normal variability of the system. The data from the remaining 8 months in 1982 have a mean efficiency of 98.7 percent with a standard deviation of 0.53 percent. Assuming a normal distribution of monthly measurements, the probability of this carbon adsorber falling below an efficiency of 95 percent due to random variability would be less than 10^{-9}, i.e., one chance in a billion. These data show that with the use of BDT, i.e., a total enclosure and a carbon adsorber, the standard of 93 percent overall reduction is achievable.

Additional information also was sought on the two adsorbers operated by 3M Company (Table C-8).[2] The specific data received were declared confidential by the company and cannot be discussed here. The Agency's

conclusion based on this and other information received on 3M's adsorbers is that a standard deviation computed from these data cannot be assumed to be representative of a system that has been designed, maintained, and operated for consistent maximum performance.[3]

Information on this subject also was sought from carbon adsorber manufacturers. The representatives unanimously agreed that if properly designed and operated, fixed-bed carbon adsorption systems can achieve efficiencies of 95 percent or above at all times.[4-6] The operation of such systems must be coordinated with production, and adsorption/desorption cycles must be based on monitored outlet concentration rather than elapsed time. Also, a program of regular maintenance must be established and carried out. Magnetic tape manufacturers adhering to these operation and maintenance principles should have little difficulty maintaining the necessary adsorber efficiency.

The Agency has carefully reviewed other control device data that indicate some variability in performance. In 100 percent of the cases studied, the excursions to performance levels below 95 percent could be directly attributed either to poor maintenance and system operation or to an undersized control device. The data from plants inside and outside the magnetic type industry derived from a period of normal operation indicate that continuous long-term control device efficiency in excess of 95 percent is achievable even with variations in operation. Thus, based on these data, which vendors support, the Agency concludes that the standard as proposed provides sufficient margin to account for the extremely small variability expected of control devices. (See also the response to Comment 2.1.2.)

2.1.2 Comment.

One commenter (IV-D-32) made the following public comment about the performance of carbon adsorption and the achievability of the proposed standard:

> "The proposed rule's compliance provision is based on a performance test whose duration, while unspecified, is in terms of minutes and hours, not days and months, the monitored parameter data reporting requirements are also written in terms of 3-hour averages. Because almost all of the Agency's record data is based on monthly averages there is nothing in the record addressing and resolving issues

concerning the short-term variability of the control systems. The 93 percent overall recovery standard should be reduced to account for short-term variability."

The commenter specifically questioned whether any supporting data exist for the Agency's position that 95 percent VOC removal efficiency can be achieved continuously by carbon adsorption systems over all averaging periods, including short-term periods. The commenter submitted information which indicates 24-hour averages of efficiency of his adsorption system vary dramatically from day to day. Highs above 95 percent were followed quickly by lows of less than 90 percent, with no short-term pattern evident.[7] It was this information that caused the commenter to question the Agency's decision to require corrective action by a source based on short-term evidence that the efficiency of the adsorber has failed to meet the required level of control.

Response.

Summary

The EPA has reviewed the available data on the design, operation, and performance of carbon adsorption systems, including data submitted by commenters during the public comment period and supplemental information solicited by the Agency in response to this commenter's concern, and has concluded that carbon adsorbers can achieve a 95 percent VOC removal efficiency continuously over the short term as well as on a long-term basis (these data are in the project docket). Therefore, the Agency has no reason to change the standard to account for short-term variability.

The Agency acknowledges that only relatively long-term carbon adsorber efficiency data (2-week to 1-month averages) were included in Appendix C of the Volume I BID. Since the time of proposal, EPA has evaluated existing short-term performance data; collected additional design, operation, and performance data from plants inside and outside the magnetic tape industry; and reexamined, with the help of carbon manufacturers and custom carbon adsorption equipment designers, the elements that could affect short-term adsorber efficiency. This analysis has reinforced the Agency's original conclusion that a properly designed, operated, and maintained carbon adsorption system can continuously maintain a VOC removal efficiency of 95 percent or greater. Although the

commenter's data were submitted after the close of the comment period, a detailed study of the commenter's adsorption system was conducted. It was determined that this carbon adsorber is significantly underdesigned for the actual solvent loading it is required to control. This results in the system being operated a significant portion of the time when the solvent-laden air (SLA) has already broken through one or more of the carbon beds. As a result, this system shows significantly reduced efficiency and also significant variations in efficiency from day to day and cycle to cycle. There is no evidence to show that the poor performance of this system stems from any inherent difficulty in adsorbing the particular solvent blend in use. Therefore, the Agency has concluded that those data are not representative of a properly designed, operated, and maintained system and that the erratic performance of the commenter's adsorption system can be traced to these problems. Additional information on carbon adsorption generally and on the commenter's system can be found in the docket (IV-A-4).[8]

However, review of information obtained in response to the comment has led the Agency to revise the averaging periods for the testing and monitoring requirements from periods of a fixed duration to periods that include an integral number of complete adsorber cycles. The revised periods remain short-term averaging periods. It is believed that these revisions will result in more accurate characterization of the performance of the carbon adsorption system. The new requirements are included in the promulgated standard and are discussed in detail in the summary of changes in Chapter 1.

Background

The Agency's conclusion that carbon adsorbers can be designed and operated to achieve recovery efficiencies in excess of 95 percent continuously are summarized below. The discussion is presented in three parts: theory, design, and operation.

1. Theory. The inherent phenomenon of adsorption makes it highly unlikely that the efficiency of an adsorption system will vary significantly over a short time period. Adsorption separation is based on the molecular attractive (van der Waals) forces between certain solids (adsorbents) and gases (adsorbates). The molecules of adsorbate collect

on the surface of the adsorbent. The capacity of the adsorbent for the adsorbate is largely a function of surface area but depends on other factors as well.

Adsorption is an exothermic process. The amount of heat liberated, a function of the magnitude of the attractive force, is equivalent to about two times the heat of condensation of the adsorbent.[9]

Physical adsorption is a reversible process; the adsorbate can be removed from the adsorbent by heating (or by reducing pressure). The affinity of an adsorbent for an adsorbate increases with decreasing temperature and decreases rapidly with increasing temperature, making temperature change the most common means of removing adsorbates from the adsorbent. The ease with which the adsorbate can be removed is a key element in sizing and operating an adsorption system.

So-called "activated" carbon is the most commonly used adsorbent for removing low-concentration organics from air streams because of their affinity for the adsorbent and the ease of desorption. Carbon, typically made from coal, wood, petroleum pitch, fruit pits, or coconuts, is "activated" to increase the surface to volume ratio by exposure to steam or carbon dioxide at temperatures in excess of about 600°C (1100°F). These gases attack the carbon and increase the pore structure. Surface areas of typical activated carbons range from 600 to 1,600 m^2/gram (65 to 180 acres per pound).[10] Depending on the precurser and particle size, this amount of surface area could be provided by only the amount of carbon needed to fill 2 to 5 gal jars. The variety of precursers and options for activation permit some optimization in the design of carbon for select organics. The physical properties of the carbon (pellet size, pore size, and precurser) determine the operating characteristics of the carbon, the adsorptive capacity and rate, the resistance to gas flow, and the desorption characteristics.

The capacity of a select mass of carbon to retain organics is generally a function of the amount and availability of surface area. The size or diameter of the carbon pores and the pore size distribution are, therefore, critical factors. Large pore sizes contribute little to molecule capture; they serve mainly as passageways to the smaller pores where the adsorption forces are strongest. Adsorption forces are

strongest in pores that are not more than approximately twice the size of the molecule to be adsorbed.[11] Most organic air pollutant molecules range from 40 to 90 nanometers. If the pores are less than 40 nanometers in diameter, the organics will be unable to reach the internal surfaces.

Adsorption may be considered a three-step phenomenon. The organic molecule first moves from the airstream to the external surface of the carbon by diffusion. Next, it migrates from the relatively small external surface area into the enormous pore surface area. Finally, the molecule adheres to a site within a pore. The carbon is saturated when equilibrium is reached (i.e., the number of molecules released by the carbon is equal to the number of new arrivals). At that time, the outlet organic concentration will be in equilibrium with (equal to) the inlet concentration.

Because of the tremendous surface area available in activated carbon and its affinity for gaseous organics, even at low concentrations, the adsorption process is nearly instantaneous. A very thin film of carbon is, therefore, able to reduce the concentration in an airstream to near zero until the carbon approaches saturation.

Although in theory the adsorption phenomenon is totally reversible, practical considerations, primarily the cost of energy, prevent operators from being able to heat the carbon to sufficient temperature to remove all of the adsorbate. Because of these practical temperature limitations, some organic molecules deep within the carbon remain too tightly bound to be removed. This phenomenon is especially noticeable during the first few adsorption cycles but continues incrementally through the "life" of the carbon.

The adsorbate (organics) retained on the carbon after a desorption cycle is referred to as the "heel." Because this heel or residual increases with successive cycles, it gradually decreases the "working capacity" of adsorbent--the ability to adsorb new organics. This working capacity decreases rapidly for the first half-dozen adsorption cycles of virgin carbon, then only incrementally with additional adsorption cycles. (At any point the carbon can be reactivated completely by exposure to very high temperatures, at which time it will recover its original virgin carbon capacity.)

This subsequent gradual decrease in capacity is believed to be due primarily to buildup of high molecular weight compounds not released during the desorption cycle. Other factors that contribute are oxidation of the carbon, mechanical plugging of the carbon pores, and fretting of the carbon. Collectively, all of the factors that detrimentally affect the carbon during its life are referred to as "fouling."

The above-described unique inherent characteristics of activated carbon and its affinity for organics are the key design features for an air pollution control device that differs little from solvent recovery systems that have been in use by industry for decades.

2. Design of an Adsorption System. Inasmuch as the commenter's adsorber is a conventional "fixed bed" system, the following discussion refers to the design of similar systems. Fixed bed adsorption systems, by definition, consist of two or more carbon beds that are operated in sequence. Each bed is operated as a batch process, and, in theory, each bed in a system is identical. For this discussion, it is important only to understand how a single bed functions in order to conclude that a properly designed and maintained carbon system can be operated at efficiencies greater than 95 percent.

It is well recognized that the affinity of activated carbon for organics is so great that carbon will scrub an airstream essentially free of organics for a period of time. As the carbon begins to saturate, it will begin to allow organics to escape from the bed in the carrier gas. The designer overcomes this capacity constraint by increasing the amount of carbon through which the air must flow, thereby increasing total capacity (although specific capacity, the amount of adsorbate that a given mass of adsorbent can retain, remains constant) and allowing the intervals between the times when the carbon must be removed from service for desorption to be extended.

Figure 2-1 illustrates how quickly and dramatically carbon removes organics from an airstream. It shows the concentration profile of an airstream at some time, T_1, after a carbon adsorber bed is placed on stream. Figure 2-2 illustrates the concentration profile at a later time, T_2, and Figure 2-3 presents the concentration profile at a still later time, T_3. Figure 2-4 represents the concentration profile at a time, T_4, after breakthrough has occurred.

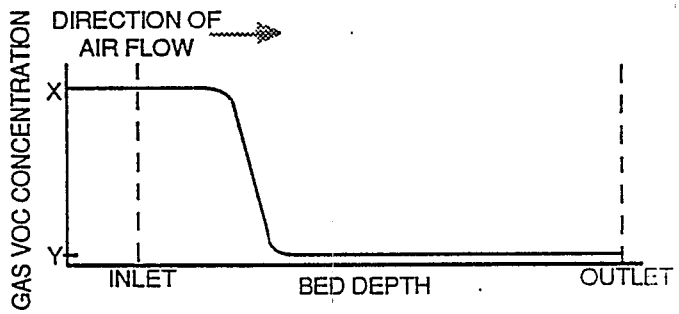

Figure 2-1. VOC penetration of activated carbon adsorption bed at time T_1.

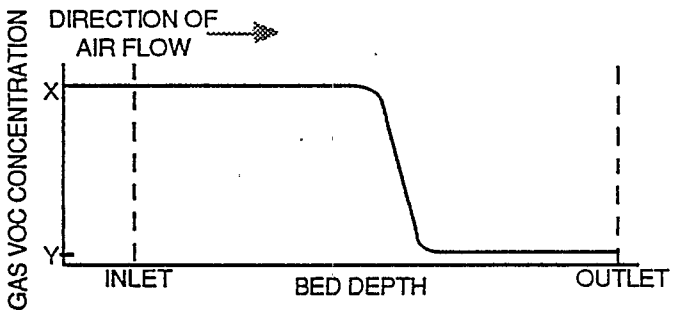

Figure 2-2. VOC penetration of activated carbon adsorption bed at time T_2.

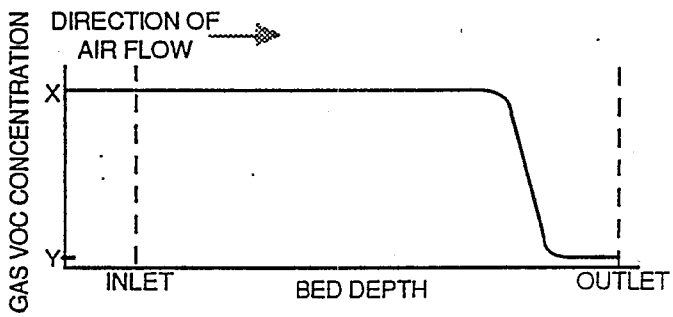

Figure 2-3. VOC penetration of activated carbon adsorption bed at time T_3.

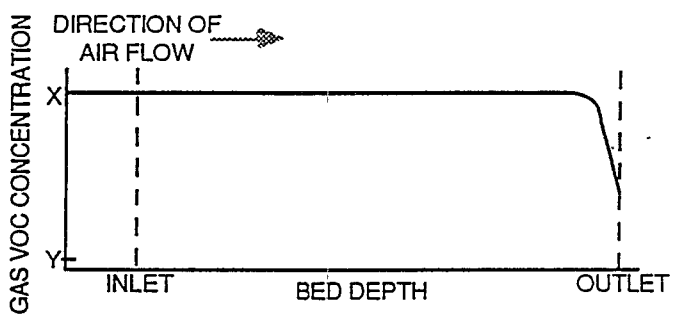

Figure 2-4. VOC penetration of activated carbon adsorption bed at time T_4.

If one envisions the inlet concentration as a "front" which gradually moves through the carbon bed, two things become obvious. First, the time required for the front to penetrate the bed can be extended by increasing the thickness or depth of the bed. Second, at some time shortly after T_3, when the front begins to emerge from the carbon bed (T_4 in Figure 2-4), the outlet concentration will climb rapidly until it reaches equilibrium with the inlet concentration. The bed is then saturated, and no further adsorption is possible.

It is the operator's responsibility to anticipate this predictable cycle and ensure that the bed is removed from service before the amount of organic that escapes exceeds 5 percent of the total organic load introduced during the adsorption cycle, the period that the adsorber is in service.

The operator, of course, is interested primarily in the outlet concentration and how it varies with time. Figure 2-5 presents the outlet concentration from a typical bed from the time it is placed in service until the front begins to break through, causing the outlet concentration to increase rapidly as the final layer of carbon at the outlet saturates and equilibrium is achieved.

If the operator properly anticipates the breakthrough time, he may operate his adsorber at exceedingly high overall efficiencies. For example, based on the range of values found in this industry, a typical VOC inlet (X) concentration might be 3,000 parts per million by volume (ppmV) and a typical outlet (Y) concentration might be 30 ppmV.[12] The result is that the adsorber operates at 99 percent efficiency during the bulk of its adsorption cycle. Only after breakthrough does the instantaneous efficiency fall dramatically enough to influence the efficiency of the entire cycle.

Figures 2-1 through 2-4 represent the instantaneous performance of a carbon bed at specific times during a single adsorption cycle. As stated above, Figure 2-5 represents the outlet concentration curve from the same bed over the same period of time. None of the figures demonstrate the effect of fouling, which is appropriate because fouling does not affect instantaneous performance or outlet concentration. Rather, the effect of fouling is measured in terms of the length of each adsorption cycle.

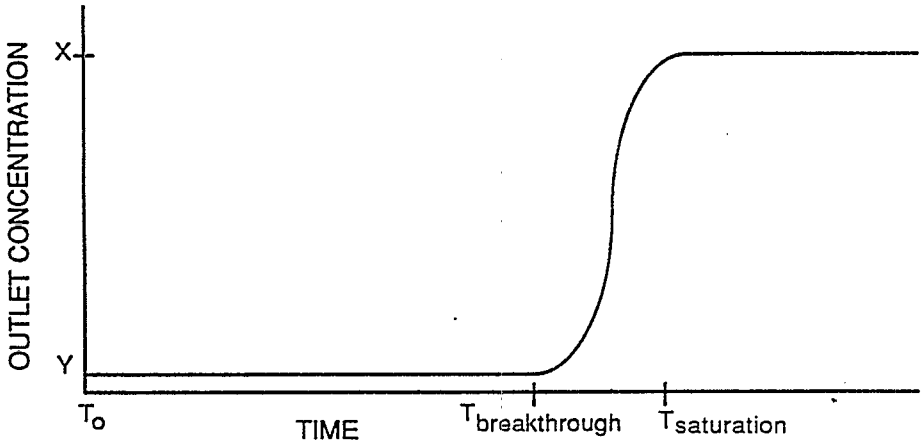

Figure 2-5. Typical carbon adsorption breakthrough curve.

Fouling is generally a long-term phenomenon and, for many adsorption systems, has little appreciable effect on the performance of an adsorber over a period of years. The commenter's organics, however, include some that are not easily desorbed and may have second-order effects that hasten fouling. Because of fouling, the useful life of the commenter's carbon is measured in months rather than years. Its effect on operation manifests itself by reducing the time before breakthrough occurs on a bed.

As explained earlier, fouling decreases the active sites within the carbon bed available for adsorbing organics. The result is a more rapid decrease in working capacity than would be encountered with many organic-bearing airstreams. Since the inlet organic load to an adsorber is presumed constant, the reduced working capacity causes the adsorber to approach breakthrough with increasing rapidity. If the operator does not coincidentally reduce the time the adsorber remains in service, then he greatly increases the amount of organic allowed to pass through the system (as illustrated in Figure 2-4) as the bed operates in a post-breakthrough period.

Information submitted by the commenter in response to our investigation revealed precisely this flaw in operation. The commenter routinely permits beds to remain in service not only beyond breakthrough but well into and beyond saturation as shown in Figure 2-5.[13] This has a dramatic effect on cycle efficiency. If breakthrough is achieved in 2 hours and an adsorber is allowed to operate 4 hours, the average cycle efficiency would decrease from 99 percent immediately prior to breakthrough to about 50 percent 2 hours later.

Given this overwhelming effect on efficiency of operation beyond breakthrough, why would an operator not remove a bed from service before breakthrough occurs? There are several possible reasons.

1. The operator may not be aware of how quickly the concentration rises after breakthrough and the resulting deleterious effect on the efficiency of his adsorption system.

2. The operator may have no way of knowing when breakthrough occurs (suitable analytical instruments have not been installed).

3. The operator may not have a replacement bed properly desorbed and cooled, ready for service.

The first two reasons are operational problems and easily overcome. The third may be a consequence of the original system design and not easily overcome without significant cost. For example, assume an operator purchases a two-bed system where he plans for one to be in service (adsorbing) while the second is desorbing. Further, assume the system is designed for a 3-hour adsorption cycle, a 1-hour heating cycle, and 0.5 hour to cool the regenerated bed to prepare it for service. With this design, the operator will have little problem during the early life of the carbon. It is only as the normal decrease in working capacity begins to limit the adsorption cycle to about 2 hours onstream that the operator may be forced to compromise.

Good operating practice would cause him to replace the carbon before the adsorption cycle is equal to the combined times required for steaming and cooling. If he does not replace the carbon, however, he is forced to compromise either by leaving one bed on stream too long with the attendant losses after breakthrough or by placing in service a bed that has not been properly regenerated. The latter action would reduce overall efficiency because of the reduction in adsorptivity and, subsequently, the equilibrium capacity and the working capacity. Premature breakthrough would be inevitable and instead of exhausting at concentration Y (see Figure 2-1), the outlet concentration could be significantly higher.

3. Operation. After completing this review of carbon adsorption theory and practical design of carbon adsorption systems in response to public comments, the Agency continues to believe that a sudden change in the efficiency with which an adsorber removes organics from an airstream an indication that the system is improperly designed, maintained, or operated. The following discussion of factors that can affect performance should reinforce the conclusion that, if performance factors are properly considered during the design stage, only improper operation could cause subsequently unpredictable performance.

The major factors affecting performance are temperature, humidity, VOC concentration, volumetric flow rate, "channelling" (nonuniform flow through the carbon bed), regeneration practices, and changes in the relative concentrations of the VOC's admitted to the adsorption system. The potential effects of these factors and countermeasures are discussed below.

Temperature. As temperature rises, the capacity of the carbon to adsorb VOC's rapidly diminishes. For instance, a rise in temperature from 25° to 60°C (77° to 140°F) will reduce the equilibrium adsorptive capacity of one type of carbon for toluene (at a concentration of 2,500 ppmV) by approximately 25 percent, from a specific mass ratio of about 4 (0.37 kg toluene per kg carbon [lb toluene per lb carbon]) to about 3 (0.29 kg/kg).[14] This would decrease the working capacity of the carbon bed and the useful adsorption time, making an adsorption system operated by a time cycle vulnerable to an apparent rapid decrease in efficiency. The potential causes of elevated temperature can be avoided by ensuring that the design properly compensates for the range of conditions that might be encountered during operation. These conditions include the temperature of the inlet SLA stream, the ambient conditions surrounding the adsorber, and sufficient time to cool each carbon bed thoroughly before it must be returned to service. Once the system is installed, the last parameter is the only one over which the operator can exercise control. The operator must recognize the point at which declining working capacity prohibits proper cooling of the bed and threatens the efficiency of the system.

The bulk of the VOC in the SLA stream at a magnetic tape coating plant will originate in the drying oven(s). The hot exhaust gases must be cooled to the design operating temperature of the adsorber (e.g., from 80°C [180°F] at the oven outlet to 40°C [100°F] or less at the adsorber inlet). Care must be taken to ensure that the cooler is designed for the worst-case SLA stream (i.e., the greatest heat load combination of volumetric flow rate, oven exhaust temperature, and sensible heat content of SLA stream).

Adsorber performance also can be affected by external temperatures. Care should be taken to ensure that equipment is protected from surrounding heat sources such as steam turbines or direct sun that might increase the typical operating temperature of 40°C (100°F) above the design value.

Humidity. Humidity is not expected to be a problem in the magnetic tape industry because product quality concerns cause most plants to condition the air to the application/flashoff areas and drying ovens. Further, inasmuch as the carbon is normally saturated after the steaming

and cooling desorption cycle, humidity is rarely a concern in any adsorption system. In an extreme situtation, humidity can decrease working capacity, although the effect is significant only when the relative humidity is high or the VOC concentration is low. Even then, carbon may still be a viable control option, although pretreatment with a condenser or other device to remove water vapor may be required, particularly for low-organic concentration streams ($\leq$300 ppmV).

VOC Concentration. The working capacity of carbon increases as VOC concentration increases. For instance, the specific mass capacity of one type of carbon for toluene at 25°C (77°F) increases by about 5 percent when the concentration rises from 2,000 to 3,000 ppmV.[14] Since the outlet concentration from the adsorber is not significantly affected by the inlet VOC concentration, the instantaneous efficiency of a carbon adsorber will increase almost imperceptably from 98.5 to 99. The increased mass loading rate, however, will shorten the effective adsorption cycle since the working capacity will be consumed approximately 70 percent more rapidly causing quicker breakthrough. Therefore, the adsorption system must be designed with adsorption, desorption, and cooling cycles to accommodate the highest inlet concentration to be expected from the system.

Low inlet concentrations can also affect efficiency. Since the outlet concentration from an adsorber is determined by the saturation condition of the last few inches of carbon and is relatively constant, a significant decrease in inlet concentration can affect overall efficiency. For instance, if the inlet concentration of a system with an outlet concentration of 30 ppmV were to fall to 500 ppmV for an entire cycle, the adsorber's efficiency during that cycle would be only 94 percent. This could occur in an adsorber system that normally serves four coating operations and operates with an inlet concentration of 2,000 ppmV if three coaters were to shutdown, and the operator allowed the other exhausts to feed the adsorber. The three offstream exhausts would dilute the VOC concentration from the fourth line. Such a decline in adsorber efficiency can be avoided by adjusting the airflow volume to maintain a constant inlet concentration. Obviously, the minimum expected inlet concentration must be a consideration in the design of an adsorption system.

Volumetric Flow Rate. The efficiency of a carbon adsorber is unaffected by reductions in the volumetric flow directed to it (the only tangible effect is that the adsorption cycle can be extended because the available working capacity will be filled at a slower rate. It is difficult to conceive how the flow through an adsorber can increase significantly above the design rate during normal operation. One possible way is if operator error causes removal of one bed from adsorption service in a system that normally operates with two or more beds on line. This could have an adverse impact on efficiency if the resulting increase in velocity through the bed reduces the contact time between carbon and the SLA below some critical minimum necessary for adsorption to take place.

Channelling. Channelling means that the flow through the carbon bed is not uniform; poor flow distribution due to original design is the most common cause.[9] When channelling occurs, the inlet gas stream follows a narrow path through the carbon, and, therefore, the portion of the carbon that contacts the SLA is reduced. The working capacity of the carbon that is exposed will quickly be consumed, and breakthrough will occur prematurely.

Regeneration Practices. Failure to regenerate the carbon bed to design conditions during the desorption cycle can cause variations in adsorber efficiency. In all adsorption systems, some residual VOC's (the heel) will be left on the carbon bed after the desorption cycle because the energy cost that would be incurred to desorb the most tightly held molecules deep in the carbon pores is prohibitive. The adsorption system is designed to accommodate the heel and still achieve a specified level of performance. If the desorption cycle is inadequate and VOC's in excess of the design heel remain on the carbon when the adsorption cycle is begun, the working capacity of the carbon bed will be reduced, and breakthrough will occur sooner.

Good design will ensure that desorption steam and cooling air are introduced countercurrent to the direction of the SLA stream flow. The outlet concentration that prevails prior to breakthrough is primarily determined by the condition of the carbon at the exit of the carbon bed and will vary little with variations in other parameters. Countercurrent desorption and cooling will ensure that the last few inches of the bed

(during the adsorption cycle) are the cleanest and coolest carbon in the bed. The quantity and quality of steam applied to the carbon bed during regeneration must be sufficient to return this portion of the carbon bed to design conditions. Also, it is important that the steam be uniformly distributed across the carbon bed so all the carbon in the last few inches of the bed will be regenerated equally. If the problem of poor steam distribution is very pronounced, some portions of the bed may be regenerated poorly or not at all throughout the depth of the bed. When the adsorber vessel is brought back into service, these parts of the bed will experience breakthrough quickly, the outlet concentration of the system will quickly rise above the design level, and adsorber efficiency will be reduced correspondingly.

VOC Characteristics. The adsorptive capacity of carbon varies with the compound to be adsorbed. Generally, compounds with low vapor pressures will be adsorbed preferentially over those with high vapor pressures, and nonpolar compounds will displace polar ones. The capacity of the carbon varies somewhat from compound to compound, and each compound or mixture of compounds will have its own unique working capacity. Thus, the length of adsorption service prior to breakthrough will be fixed by the composition of the SLA stream. Variations in working capacity will not adversely affect efficiency if a breakthrough monitor is in use and the adsorption system is designed with adequate capacity for the least-adsorbable formulation to be used at the facility. Proper system design will allow sufficient cycle time to ensure that a regenerated adsorber vessel will be ready to receive the SLA stream when the monitor indicates that breakthrough has been reached.

The presence of ketones in the SLA stream also can affect adsorber performance. See Comment 2.7.1 for a discussion of these effects.

Conclusions

All of the performance factors that affect the reduction efficiency of a carbon adsorber are controllable if the system has been properly designed to handle the organic material actually delivered to it. Furthermore, monitoring of the outlet concentration from each bed is technically feasible and commonly practiced and provides a means of discerning the appropriate time to remove a bed from adsorption service

regardless of the working capacity of the carbon.[15] The functional difference between fresh virgin carbon and carbon that is near the end of its useful life is the length of time the carbon can remain onstream before breakthrough occurs. The air pollution control efficiency is primarily a function of how long the carbon bed is allowed to remain onstream past breakthrough, not the age of the carbon.

The age of the carbon affects only the working capacity, hence, the length of time that it can remain onstream in an adsorptive capacity before breakthrough occurs. In order to maintain a high removal efficiency, an operator will have to replace his carbon when the adsorption cycle becomes too short to permit the offstream bed to be properly desorbed and cooled. The operator may choose to replace the carbon if the incremental steam costs that result from the increased frequency of desorption make it more economical to replace the carbon.

2.1.3 Comment

Three commenters (IV-D-3, IV-F-1 [Haynes], IV-D-13, IV-D-32) noted that the standard for the pressure sensitive tapes and labels (PSTL) industry, which includes the plant that the Agency is relying on for technology transfer, was set at only 90 percent control. One commenter (IV-D-3) indicated that the standard for the magnetic tape industry should, therefore, be no higher. Another commenter (IV-F-1 [Haynes], IV-D-13) believes that the standard should be less than 90 percent. The third commenter stated that EPA must justify the imposition of a stricter standard on the magnetic tape manufacturing industry.

Response. The PSTL data were used in the development of the magnetic tape manufacturing industry standard because these two industries are similar both in the processes used and in the controls determined to be BDT. However, different levels of control are appropriate for the two industries. Some products manufactured at PSTL plants retain sufficient solvent in the dried web such that 93 percent control of applied solvent was judged not to be achievable in all cases. There is virtually no solvent retained in magnetic tape products after they leave the drying ovens; thus, all the applied solvent is available for capture by a well-designed capture device. If, however, an owner or operator submits specific information to the Administrator that justifies the need for retained

solvent in a product, the revised standards now allow the fraction of retained solvent to be included in the material balance calculation of VOC recovered. In addition, the level of the proposed NSPS for coating operations at magnetic tape plants was not based solely on the data from the one PSTL plant. A test of a magnetic tape line with control of only oven emissions demonstrated 93 percent control of applied solvent. A representative from a second plant controlling only oven emissions has stated that a 92 percent overall reduction in applied solvent is achieved by the control system. Use of a well-designed capture device in the application/flashoff area would be expected to increase the control efficiency. Therefore, the Agency concludes that the proposed requirement for 93 percent control of VOC emissions from new coating operations is supported by the available data. (See Section 2.3 for further discussion of the level of control on new and modified coating operations.)

2.1.4 Comment

One commenter (IV-F-1 [Haynes], IV-D-13) stated that the baseline level of control presented in the BID (83 percent) is too high. According to the commenter, the State implementation plan (SIP) level of control at his facility is 53 percent, and the proposed increase in the required level of control to 93 percent is unreasonably large.

Response. The baseline control level of 83 percent was based on existing State regulations. Emissions from coating operations in the majority of the States (including the commenter's State) are limited to 0.35 kg of VOC emitted per liter (ℓ) of coating applied (2.9 lb of VOC emitted per gal of coating applied). A typical coating composition in this industry is 0.72 kg of VOC per ℓ of coating (6 lb of VOC per gal of coating), and the average solvent density is 0.90 kg per ℓ (7.5 lb per gal).

The calculations were performed assuming that the coating line must emit no more VOC than would be emitted if the line used a low-solvent coating (0.35 kg VOC/ℓ coating minus water [2.9 lb VOC/gal coating minus water]) equivalent to the State emission regulation. The baseline control level was calculated on the basis of the volume of coating solids applied as follows.

Typical coating composition by volume:

$$\frac{0.72 \text{ kg VOC/}\ell \text{ coating}}{0.90 \text{ kg VOC/}\ell \text{ VOC}} = 0.80 \ \ell \text{ VOC/}\ell \text{ coating minus water}$$

(0.8 gal VOC/gal coating minus water)

Thus, the typical coating is 80 percent VOC by volume and 20 percent solids by volume.

Typical coating composition--mass VOC per volume coating solids:

$$\frac{0.72 \text{ kg VOC/}\ell \text{ coating}}{0.20 \ \ell \text{ solids/}\ell \text{ coating}} = 3.6 \text{ kg VOC/}\ell \text{ solids (30 lb VOC/gal solids)}$$

Low-solvent coating (equivalent to State regulations) composition by volume:

$$\frac{0.35 \text{ kg VOC/}\ell \text{ coating}}{0.90 \text{ kg VOC/}\ell \text{ VOC}} = 0.39 \ \ell \text{ VOC/}\ell \text{ coating (0.39 gal VOC/gal coating)}$$

Thus, the compliance low-solvent coating is 39 percent VOC by volume and 61 percent solids by volume.

Low-solvent coating composition--mass VOC per volume coating solids:

$$\frac{0.35 \text{ kg VOC/}\ell \text{ coating}}{0.61 \ \ell \text{ solids/}\ell \text{ coating}} = 0.6 \text{ kg VOC/}\ell \text{ solids (4.8 lb VOC/gal solids)}$$

Emission reduction achieved by the State regulations:

$$\frac{3.6 \text{ kg VOC/}\ell \text{ solids} - 0.6 \text{ kg VOC/}\ell \text{ solids}}{3.6 \text{ kg VOC/}\ell \text{ solids}} = 0.83$$

Thus, the control level achieved by the State regulations is 83 percent. Because the majority of the States require the same VOC control level, the Agency believes that this is a reasonable baseline level. Furthermore, the Agency's analysis has shown that the level of the standard, 93 percent, is achievable and reasonable relative to this baseline.

2.1.5 Comment

Two commenters stated that the capture efficiency of a negative-pressure enclosure would be less than estimated by EPA because of the need for periodic operator access (IV-F-1 [Sower], IV-D-5). This problem would be compounded in the case of rapidly evaporating solvents, thus further reducing the control efficiency of the enclosure. The commenters stated that any reduction in capture efficiency below 98 percent, assuming a 95 percent control device efficiency, would render attainment of overall 93 percent emission control impossible. One of the commenters (IV-D-5) stated that because the type of coating used in the PSTL test would have lower emissions in the flashoff area than magnetic tape coatings, fugitive VOC emissions would be lower, and, therefore, the level of control could be higher than in the magnetic tape industry.

Response. While it is true that periodic operator access is necessary in web coating operations, this fact does not preclude achievement of the standard. Industry representatives (including these commenters) agreed at a meeting with EPA held on May 7, 1986, that the standard is technologically achievable.[16] The PSTL plant cited above achieved a 93 percent reduction despite the relative difficulty of controlling an operation characterized by short production runs employing a wide variety of solvents and solvent blends. Also, as was discussed in the response to Comment 2.1.2, one magnetic tape plant controlling only the oven achieved 93 percent efficiency.

The Agency does not agree that coatings used in the magnetic tape industry will suffer proportionally greater fugitive losses in the application/flashoff area than will those used at the PSTL plant because of the relatively low line speed at the PSTL plant and the use of coatings of similar solvent content. In any case, emissions within a properly designed and operated enclosure will be directed to the control device just as are those within the oven.

2.1.6 Comment

One commenter (IV-D-28) stated that EPA should consider the extent to which the control level set by the NSPS is achievable by existing industry participants. The commenter stated that some companies do not currently possess the required technology, while others already have it and consider

it to be proprietary. The commenter believed that the regulation could threaten the existence of a company that does not already possess technology that is not available to it.

Response. The NSPS program encourages the development of more efficient capture and control technologies. New source performance standards are based on BDT that yields the greatest emission reduction without imposing unreasonable impacts. The control device technology necessary to meet these standards is openly available to the entire industry. Furthermore, applicable industrial ventilation technology that will allow the standards to be met is generally available to all members of this industry. For those sources choosing to demonstrate compliance using the equipment alternative method, there is sufficient leeway allowed in the structure of the total enclosure to permit development and use by all segments of the industry.

2.2 BEST DEMONSTRATED TECHNOLOGY (BDT)

2.2.1 Coating Operation

2.2.1.1 Comment. Several commenters stated that magnetic tape products, particularly computer tape, cannot be produced in the sort of negative-pressure total enclosure required by the proposed standard for the coating operation (IV-F-1 [Carlson, Forbes], IV-D-3, IV-D-4, IV-D-6). The commenters described a "clean room operation" as standard operating practice in the production of high-quality computer and video tapes and stated that the trend is toward more stringent standards for "clean room" environments. In a "clean room," air is filtered so that it contains less than 100 particles 0.15 to 0.5 micrometers in size or larger per cubic foot of air. This prevents dust and debris in normal room air from settling on the wet tape and causing a quality defect that would lead to rejection of the product (IV-F-1 [Carlson]). Because the "clean room" must be maintained at positive pressure, VOC emissions will be greater than they would be in a negative-pressure enclosure. One commenter (IV-F-1 [Forbes]) stated that neither the Volume I BID nor the proposal preamble adequately addresses the quality issue and that there is no information in the Volume I BID about the actual use of negative-pressure enclosures at magnetic tape plants.

Response. A meeting of EPA and industry representatives was held on May 7, 1986, to discuss industry concerns with the proposed NSPS. Attendees from industry included all those who presented comments at the public hearing (IV-F-1) except Mr. Richard H. Forbes of Eastman Kodak Company. Mr. Mark Damas of CBS, who did not present comments at the public hearing, also attended the meeting in May. At the meeting, industry representatives agreed that all types of magnetic tapes can be manufactured at facilities equipped with BDT. The concern expressed by industry was the cost to achieve the standard at modified and reconstructed facilities (see Section 2.6), not the achievement of 93 percent control or problems with product quality. The air handling techniques designated as BDT are currently in use in the magnetic tape industry, including at least two plants manufacturing computer tape. On this basis, the Agency concludes that BDT is practical and that the standard is technologically achievable for all segments of this industry. See the response to Comment 2.2.1.2 for further discussion of the considerations appropriate to the determination of BDT.

2.2.1.2 Comment. Because of the concerns for product quality discussed in Comment 2.2.1.1, some commenters (IV-D-32, IV-F-1 [Carlson, Forbes]) said that BDT has not been demonstrated for the magnetic tape industry and that extensive development costs would be required by the industry to meet the proposed standard. One commenter (IV-F-1 [Carlson]) said that the standards should be rewritten "using a BDT from the magnetic tape industry" (i.e., control of the oven only) and that "different BDT's might be needed for each segment" of the industry. The other commenters (IV-D-32, IV-F-1 [Forbes]) said that the PSTL plant that provided the data supporting the proposed standard would not be capable of producing high-quality magnetic tape and would, therefore, not be considered an adequate demonstration of BDT for the magnetic tape industry. One commenter (IV-F-1 [Carlson]) said that, according to his review of previous court cases, technology transfer should be based on specific equipment rather than a process.

Response. The commenter (IV-F-1 [Carlson]) was contacted for additional information about the court cases to which he referred in his comments. He was unable to supply specific citations. The Agency has

located several decisions that deal in part with the appropriate considerations in the determination of BDT. In no case was the issue raised concerning a distinction between processes and specific pieces of equipment.

In the case of International Harvester v. EPA, 478 F.2d 615 (D.C. Cir. 1973), the Court ruled that a projection based on existing technology may be made, subject to the restraints of reasonableness. This stance was reiterated by the Court in the cases of Portland Cement Association v. Ruckelshaus, 486 F.2d 375 (D.C. Cir. 1973), Essex Chemical Corp. v. Ruckelshaus, 486 F.2d 427 (D.C. Cir. 1973), and National Asphalt Pavement Association v. Train, 539 F.2d 775 (D.C. Cir. 1976). This concept was upheld in the case of Sierra Club v. Costle, No. 79-1565 (D.C. Cir. 1981), in which the Court stated ". . . we believe EPA does have the authority to hold the industry to a standard of improved design and operational advances, so long as there is substantial evidence that such improvements are feasible and will produce the improved performance necessary to meet the standard." In CPC International, Inc. v. Train, 515 F.2d 1032 (D.C. Cir. 1972), treating the analogous section of the Federal Water Pollution Act (Section 306(a)(1)), the Court stated:

> (t)o base its standards on transfer technology, the EPA must: (1) determine that the transfer technology . . . is available outside the industry; (2) determine that the technology is transferable to the industry; and (3) make a reasonable prediction that the technology . . . will be capable of removing the increment required by the new source standards.

Thus, the courts have indicated that the overriding concern is that the Administrator arrive at an achievable standard through a reasonable determination of BDT.

The NSPS for the magnetic tape manufacturing industry is an achievable standard based on a reasonably determined BDT. The control technology designated as BDT has been demonstrated at a PSTL plant to achieve the percent reduction required by this standard. These air handling and control technologies are currently in use in the magnetic tape industry, including the computer tape sector where product quality is critical. The equipment, solvents, and processes used in these two web

coating industries are similar and would be expected to produce similar SLA streams. A technological system that can control the SLA streams of the PSTL industry to the required degree can be reasonably expected to do the same in the magnetic tape industry. Thus, the Agency has made a reasonable determination of BDT and has formulated an achievable standard, satisfying the requirements mandated by the courts. (See related discussion of the level of the standard in Section 2.1 and the issue of product quality in Comment 2.2.1.1.)

2.2.2 Mix Room

2.2.2.1 Comment. Two commenters (IV-F-1 [Fischer], IV-D-3) addressed the selection of carbon adsorption as BDT for mix room emissions. According to one commenter (IV-F-1 [Fischer]), the cost to install control equipment is not justified, particularly for an existing facility, because only 3 percent of plant-wide emissions are from the mix room. The commenter recommended that BDT for mix equipment be redefined as tight covers. A second commenter (IV-D-3) said that control costs for a separate carbon adsorber are significantly underestimated in the BID and result in unrealistic cost-effectiveness values. The commenter also stated that even where a common carbon adsorber could be used, the incremental cost of nearly $1,000 per ton is unreasonable compared to other standards that have been promulgated.

Response. The Agency's cost analysis presented in the Volume I BID demonstrated that the cost to control mix room emissions with an add-on control device was reasonable only if the same control device could be used to control coating operation emissions and mix room emissions. The results of this analysis agree with the commenter's statement that separate control of mix room emissions with an add-on control device is not cost effective. The standard for the mix room and the proposed affected facility definition presented at proposal were selected so that carbon adsorption control of mix room emissions would occur only when there was also an affected coating operation, and, thus, emissions from the two sources could be controlled by the same control device. At that time, growth in the industry was projected to be as a result of construction of new lines. Thus, new or existing mix equipment would become subject to the NSPS when a new coating operation and its control devices

were being constructed and capacity for the mix equipment could be included in the control device design.

Since proposal, EPA has accepted the industry's allegation that growth in the industry will occur primarily from modification or reconstruction of existing lines rather than construction of new lines (see Comment 2.3.4). In this situation, existing mix equipment may be modified when there is no construction of a new control device and the existing control device may not have sufficient extra capacity to incorporate mix room emissions. Two modification scenarios were provided by industry after the public hearing, and the site-specific control costs were determined not to be reasonable because of high airflow rates. Older pieces of mix equipment frequently have makeshift covers, and dry ingredients are added by open pouring rather than by closed pumping systems. Thus, older, modified mix equipment may require higher airflows than new mix equipment to keep the VOC concentrations in the work area at safe levels (below the threshold limit value and the lower explosive limit). These high airflows further exacerbate the problem of limited control device capacity.

The Agency's original analysis of BDT and the mix room standard at proposal were never intended to include the scenario of controlling the entire room ventilation air from the mix room. The original analysis was based on new mix equipment, which has covers that can be easily adapted to ventilation to a carbon adsorber at low airflows. After discussions with personnel at the two plants submitting comments, the Agency has concluded that retrofitting this type of low-airflow capture device to existing modified mix equipment is not always technically feasible or cost effective. Therefore, the Agency agrees that BDT for modified mix equipment should be covers instead of ventilation to a 95 percent efficient control device. However, the Agency still believes that control of new mix equipment can be achieved at a reasonable cost by carbon adsorption when a new control device is being constructed for other purposes at the plant and the SLA from the mix equipment is considered in the design of the device. In addition, the Agency believes that if covered, modified or reconstructed mix equipment is vented to a control device, lower VOC emissions would result; therefore, this alternative is allowed, and no testing is required in such cases.

The standard has been changed to require covers, alone or with venting to a control device, on all modified or reconstructed mix equipment and on new mix equipment when there is no concurrent construction of a control device on a coating operation at the plant or when the control device installed concurrently is a condenser. If new mix equipment is installed at a time when there is concurrent construction of a control device (other than a condenser) on a coating operation at the plant, covers must be used on the mix equipment and must be vented to a control device that is 95 percent efficient. The Agency selected 95 percent for the control efficiency because carbon adsorption (which can achieve 95 percent efficiency) is one component of the BDT selected for this industry. In its review of the operating data for carbon adsorbers in this and other industries, the Agency has concluded that 95 percent is achievable on a long-term continuous basis for a properly designed device (see Comment 2.1.1). Thus, any new carbon adsorber should be capable of maintaining this level of control. "Concurrent" has been defined to mean 6 months before or 2 years after the installation of the new mix equipment. This period is designated because it is consistent with the normal planning and purchase cycles for equipment of this type. The 2-year period also coincides with the period for which records required under this standard must be retained. A definition of covers and the compliance and reporting requirements for the covers have been added to the regulation. A cover is defined as a device that (1) lies over the equipment opening, (2) either extends at least 2 centimeters (cm) (0.8 in.) beyond the rim of the equipment or is attached to the rim, (3) maintains contact with the rim for the entire perimeter, and (4) is opened as seldom as possible. A nonpermanent cover may be used if it meets these criteria. The notification of actual startup is the only reporting requirement; all other monitoring, recordkeeping, and reporting requirements have been waived for plants with only affected mix equipment required to install and use covers.

2.2.2.2 Comment. According to one commenter (IV-D-3), there is a strong bias in the Volume I BID toward carbon adsorption control of mix room emissions that is unwarranted because of the problems that are encountered with the use of this technology to recover some solvents. In

particular, cyclohexanone is unsuited for carbon bed recovery because of potential hot spot formation that would result in bed fires and plugging of the bed by oxidation products. The proposed mix room standard penalizes manufacturers who select condensation as the coating operation control technology. According to the commenter, emissions from new or modified mix equipment cannot be added to the condenser controlling oven emissions without upsetting oven control because the oven and condenser have a closed-loop, steady-state air balance that would be disrupted by intermittent and variable airflow and low VOC levels from the mix room.

Response. The Agency reviewed the available data on types of solvent and associated control devices used in this industry. Plants using cyclohexanone as part of a blend of solvents have successfully controlled mix room and oven emissions with carbon adsorbers. However, those plants electing to use pure cyclohexanone have installed condensers for control of oven emissions. According to one vendor, bed fires did, in fact, occur in the one carbon adsorber installed by his company at a magnetic tape plant using pure cyclohexanone.[6]

The vendors of condensers used in this industry have agreed with the commenter's statements regarding the impact of venting mix room emissions to a closed-loop condenser on the oven.[17,18] The moist, intermittent SLA streams from mix equipment are incompatible with finely tuned, closed-loop oven/condenser systems. Use of a separate control device to control mix equipment emissions has been found not to be cost effective. Based on these data, the Agency will allow a different level of control of mix room emissions for those plants using a condenser to control coating operation emissions. For such plants, covers that meet specific criteria must be used on the mix equipment to control VOC emissions.

2.3 AFFECTED FACILITY AND MODIFICATION AND RECONSTRUCTION

The following comments are presented individually, but only one response has been written to reply to all of the comments because the issues of affected facility, modification, and reconstruction are interrelated.

2.3.1 Comment

Commenters representing three companies (IV-D-3, IV-D-4, IV-D-20, IV-D-28, IV-F-1 [Fischer]) suggested that the affected facility definition of the coating operation standard be revised to exclude existing equipment. One commenter (IV-F-1 [Fischer]) cited his company's experience that, contrary to information in the Volume I BID, modifications or reconstructions to the mix room do occur frequently. Another commenter (IV-D-28) suggested that EPA consider applying the standard to new facilities only and requiring modified or reconstructed facilities to comply with the existing State regulations (see Comment 2.7.1). A third commenter (IV-D-3) stated that retrofitting control to existing mix equipment is very costly and results in insignificant emission reduction. For this reason, the commenter recommends that existing unmodified mix equipment be excluded from the definition of affected facility. This would focus the regulation on new or significantly modified installations where incorporation of new control technology could be accomplished more economically. The commenter said that these issues were not considered adequately in the Volume I BID.

2.3.2 Comment

Commenters representing one company (IV-D-1, IV-D-21) said that combining the coating application/flashoff area and oven with the mix room in the affected facility definition implies that controlling emissions from the two areas is equally important. According to the commenter, the NSPS should emphasize control of the oven because 90 percent of the emissions are from the oven.

2.3.3 Comment

Two commenters (IV-D-1, IV-F-1 [Fischer]) noted that a minor modification to the mix room might make both the mix room and the coating application/flashoff area and oven subject to the NSPS. One commenter (IV-F-1 [Fischer]) noted that his company would have to replace its existing control equipment completely to meet either a 93 percent overall level of control or to demonstrate a 95 percent efficient control device. Another commenter (IV-D-1) said that it would be nearly impossible for an existing facility that is already highly controlled to use an emission offset to avoid becoming affected due to a minor mix room

modification. The commenter also stated that it is difficult to determine the "comparable" capital value of an entirely new "facility" to determine if reconstruction has occurred when a mix room serves two coating operations. Two commenters from one company (IV-D-1, IV-D-21) suggested that the affected facility be defined as the coating application/flashoff area and oven only, excluding the mix room. Control of the associated mix room could be required only after the coating operation has become subject to the standard. Thus, according to the commenter (IV-D-1), a minor mix room modification would not require the entire coating operation to comply. Another commenter (IV-D-4) suggested that the affected facility definition be revised to require compliance with the NSPS for only the equipment that is modified and not for the other unchanged operations (e.g., only the new mix equipment, not the coating operation).

2.3.4 Comment

Some commenters noted that it is not unusual for coating lines to be modified or reconstructed (IV-F-1 [Sower, Ford, Zosel], IV-D-6) and that the additional costs of retrofitting a coating line and controls should be considered (IV-F-1 [Zosel], IV-D-4, IV-D-6, IV-D-28). Commenters (IV-F-1 [Sower], IV-D-4) also stated that the trend in the United States is either to go offshore for production or to modify a coating line rather than to build an entirely new one. Modernization of coating lines was deemed a frequent and necessary occurrence if the domestic tape manufacturing industry is to remain competitive (IV-F-1 [Sower]). One commenter (IV-D-5) stated that the economic analysis should include an evaluation of the impact of the NSPS on modification and reconstruction. Other commenters noted that the cost to meet the standard for reconstructed or modified lines would be higher than the cost of incorporating controls into new facilities (IV-F-1 [Zosel], IV-D-28) and that this fact, coupled with the fact that most of the facilities affected would be modified or reconstructed, indicates that the proposal preamble understated the costs of compliance (IV-D-28).

Six commenters (IV-D-13, IV-D-15, IV-D-17, IV-D-18, IV-D-20, IV-E-61, 65, and 82) submitted actual or theoretical scenarios for coating line modifications at their plants and the necessary control system changes and costs. Three of these scenarios involved changes to the coating line to

increase production speed, two scenarios involved changes in the mix room equipment, and one scenario did not specify the type of modification. Four of the scenarios included the installation of new control devices for the entire modified line.

Response. In addition to the six modification scenarios submitted by industry (see Comment 2.3.4), EPA surveyed the remaining plants in the industry and confirmed that the industry now believes that growth, at least in the next several years, will occur primarily as a result of modifications to both mix equipment and coating operations.[19] The Agency performed detailed site-specific analyses of the control costs for the modification scenarios supplied by industry (Docket Item IV-B-12).[20] The details of these scenarios and the cost analyses will not be presented here because confidential treatment of all of the information submitted was requested by the plants. Three of the scenarios are likely to be actual modifications under the criteria in 40 CFR 60.14. One scenario is not likely to be a modification. The remaining two scenarios were entirely hypothetical, and not enough information could be provided to make a modification determination despite the Agency's requests for further information. However, EPA conducted a cost analysis on the five of the six scenarios for which sufficient data were supplied on the assumption that, even if the specific case was not a modification, the general concept might be valid in other cases. The cost analyses were performed for the control strategies presented by the commenters and for alternative strategies. Each cost analysis was specific for the operating practices and equipment at the plant.

The analyses indicated that modified mix equipment could require high airflows that exceed the existing control device capacity; therefore, a new control device would have to be installed to control only the mix room emissions. For the two specific scenarios, the cost to construct a separate control device was not reasonable. As discussed in the response to Comment 2.2.2.1, the Agency never intended to require control of total mix room ventilation. The analysis had been based on covering equipment to reduce airflow to the control device to a low level. However, this was found not to be feasible on older, modified mix equipment. As a result, EPA has revised BDT to be covers, alone or vented to a control device, for

modified or reconstructed mix equipment, for new mix equipment at plants without concurrent construction of a new control device, and for new mix equipment at plants with concurrent construction of a condenser. The BDT for new mix equipment at plants with concurrent construction of a control device (except condensers) for a coating operation remains control by that device (see Comment 2.2.2.2). The control device must be operated at 95 percent efficiency. Because the standard for mix equipment is an equipment standard, these new BDT determinations are also the new standards for the mix equipment.

The other three scenarios concerned increasing the level of control on the coating operation after a modification. The analyses showed that if the baseline overall level of control on an existing coating operation prior to modification is 83 to 88 percent, the cost to achieve 93 percent overall control after modification is reasonable even if a new control device must be installed. However, for the plant with a baseline overall level of control of 90 percent, the cost of adding any control equipment, even a small carbon adsorber to control only the incremental airflow, is unreasonable. Based on these results, the Agency has revised the regulation to include different standards for new and modified or reconstructed coating operations. New coating operations and modified or reconstructed coating operations with a baseline overall level of control less than 90 percent prior to making the change must still achieve 93 percent overall control of applied solvent (see Comment 2.1.2 for the justification of this level). If an existing coating operation can be demonstrated to achieve 90 percent overall control or better, it must maintain the existing overall level of control or 93 percent, whichever is greater, following modification or reconstruction. If, following a modification or reconstruction, a new control device is installed, the final standards require that the control device be at least 95 percent efficient. With the replacement of the control device, only the incremental costs of control need to be considered; these costs are considered reasonable.[21] The standards also require that, once a replacement control device is installed, the overall level of control be maintained at or above the level demonstrated prior to the modification or reconstruction. However, if the overall level of control demonstrated

with the new control device is higher than was previously demonstrated with the old control device, then the higher overall level of control (up to 93 percent) becomes the new standard of performance.

The methods of demonstrating the baseline level of control prior to modification or reconstruction are (1) the performance tests described in the regulation or (2) the use of a total enclosure that meets the new definition (see Comment 2.5.1) and a control device that is demonstrated by the procedures in the regulation to be at least 92 percent efficient. The Agency considered requiring that the lower overall level of control required at modified facilities be contingent on the demonstration of both 90 percent overall control or greater and insufficient control device capacity to accommodate the increased VOC loading due to the modification. However, no practical method was found that industry and compliance officers could use to make capacity determinations easily and accurately.

An annual solvent utilization cutoff of 38 m^3 (10,000 gal) for coating lines was included in the NSPS at proposal to avoid unreasonable control costs at facilities where the incremental emission reduction would be small. Because this cutoff was based on costs for new lines, it has been retained for new coating operations in the final rule. However, the information received from industry on the compliance costs at modified or reconstructed coating operations prompted a review of the cutoff for these facilities (Docket Item IV-B-7).[22]

Three types of equipment are critical to meeting the standards: total enclosures, drying ovens, and VOC control devices. Equipment costs for modified or reconstructed facilities are similar to those for new plants. The cost of compliance with the NSPS at a new facility is that fraction of the equipment costs that are in excess of the expenditures necessary to achieve the baseline level of control. However, in the case of a modified or reconstructed facility, the entire cost of replacement equipment is ascribed to compliance with the NSPS, resulting in considerably less favorable cost effectiveness. Industry modification scenarios indicated that, depending on the design and condition of existing equipment, installation or replacement of any or all of the three types of equipment noted above may be needed to achieve compliance. Eight of the

11 coating operations projected to be modified or reconstructed by 1991 (see Comment 2.7.1) would be required to increase control efficiency under the provisions outlined above. Based on the information received from industry, it was projected that in order to meet the standards, five would need only to install total enclosures; one would need a total enclosure and a new drying oven; one would need a total enclosure and a new control device; and one would need a total enclosure, a new drying oven, and a new control device. Using this mix of equipment requirements and the model plant parameters and costs developed prior to proposal to compute weighted average costs, it was determined that an annual solvent utilization cutoff of 370 m^3 (98,000 gal) is appropriate for modified or reconstructed coating operations. This cutoff and associated recordkeeping and reporting requirements have been added to the promulgated standards. Only one of the eight projected modified or reconstructed coating operations mentioned above is expected to be affected by this cutoff.

At proposal, each coating operation and its associated mix equipment were defined as a single affected facility. This definition was expected to result in greater emission reduction than would result from separate affected facilities for two reasons. First, it allowed the selection of common carbon adsorption control (i.e., a carbon adsorber that controls both mix room and coating operation emissions) as BDT, which would result in 93 and 95 percent control of emissions from the coating operation and mix room, respectively. (A separate carbon adsorber for mix room emissions was found not to be cost effective.) Second, the definition would have resulted in greater emission reduction than would have resulted from separate affected facilities because more mix equipment would be brought under the standard at this high level of control, i.e., when a coating operation was constructed or modified, all new and existing associated mix equipment would become affected.

As described in the response to Comment 2.2.2.1, the Agency has revised its BDT determination for mix equipment because it has been demonstrated that retrofitting carbon adsorption control to mix equipment may not always be technically feasible at a reasonable cost. As a result of the revised standards, emissions from affected coating operations will be 90 or 93 percent controlled, and emissions from most affected mix equip-

ment will be about 40 percent controlled through the installation and use of covers. Because the level of control required by the standard for the coating operation is more than twice that required for the mix equipment, the overall emission reduction will be maximized when the greatest possible number of coating operations become subject to the standard. Therefore, the Agency has selected the affected facility definition that would maximize the possibility of modified or reconstructed coating operations becoming subject to the standard. The Agency has decided to separate the coating operation and mix equipment into two separate affected facilities. This separation reduces the capital expenditure necessary to qualify as a modification or reconstruction. The following factors raised by commenters also were considered in changing the affected facility definition: (1) interpretation of the regulation, particularly compliance, modification, and reconstruction determinations, is more straightforward; and (2) the possibility is eliminated that a modification to one coating operation may cause an unchanged coating operation to become affected because they share common mix equipment, a result that was never intended with the definition at proposal.

For the mix equipment affected facility, the following possible definitions were considered: (1) each piece of mix equipment and (2) all mix equipment at a plant. Under the presumption that the narrowest definition is the most desirable because it will result in including the most modifications and reconstructions and, thus, the most emission reductions, the affected facility was defined as individual mix tanks. This definition will also make compliance, modification, and reconstruction determinations easier at plants with many pieces of mix equipment.

2.4 SOLVENT STORAGE TANKS

2.4.1 Comment

Five commenters (IV-F-1 [Carlson, Fischer], IV-D-2, IV-D-3, IV-D-6) questioned several aspects of the storage tank cost analysis and proposed standard. Comments were made on the selection of the baseline tank, the cost of a pressure vessel relative to an atmospheric tank, the safety of pressure vessels, the justification for submerged fill pipes, underground tanks, selection of BDT, and the level of the standard. The details of these comments can be found in the docket entries listed above.

Response: Based on the cost issues raised by the commenters, a cost reevaluation was performed. The details of this cost analysis are contained in docket item IV-B-2.[23] The new cost analysis demonstrates that there is no cost-effective control technology for solvent storage tanks in the magnetic tape manufacturing industry. As a result, a notice was published in the Federal Register on November 25, 1986, withdrawing the proposed standard for storage tanks (51 FR 42800). This notice was published separately rather than at the time of promulgation of the revised regulation so that facilities would not needlessly install tanks complying with the proposed standard in the interim between proposal and promulgation.

2.5 COMPLIANCE PROVISIONS

2.5.1 Comment

Two commenters (IV-F-1 [Carlson], IV-D-1) requested that EPA provide the criteria that would be used by the Administrator to evaluate enclosure designs submitted by industry as part of complying with the alternative means of emission limitation. One commenter (IV-F-1 [Carlson]) noted that the technologies for testing such a total equipment enclosure do not exist or are not practical and that the standard as written is not capable of being administered.

Response. The Agency agrees with the commenters that more complete criteria for total enclosures are needed. Therefore, total enclosure requirements were developed after a review of air handling techniques already in use in this and other industries. The suggested physical structure of the total enclosure was developed from EPA's experience with enclosures in a wide range of industries. The relative positions of ducts and openings and the locations of measurement points were developed from this experience and from industrial hygiene measurement requirements.

The requirements have been included in the final rule. Those enclosures that conform to the requirements will receive automatic approval as total enclosures. An enclosure that does not conform to the requirements may be approved by the Administrator on a case-by-case basis provided that it is demonstrated that all VOC emissions from the coating operation are contained by the enclosure and vented to the control device. It should be noted that the Agency does not intend to limit the

possible configurations of total enclosures. A total enclosure could range from a close-fitting structure around the application/flashoff area coupled with the drying oven all the way up to the room (or entire plant) housing the coating operation. Thus, where product quality concerns dictate an enclosure under positive pressure immediately around the coating operation, this enclosure may, in turn, be contained within a larger, negative-pressure total enclosure.

The current requirements and their bases are discussed below. The Agency is continuing its investigation of appropriate requirements for total enclosures and the related procedure for capture efficiency testing using temporary enclosures. The most up-to-date guidance on these matters may be obtained from the applicable enforcement agency. If necessary, the total enclosure requirements in the rule will be revised during the required 4-year reviews.

The Agency has selected average face velocity across the natural draft openings as the best indicator of complete capture. Natural draft openings are defined as any openings in the total enclosure that remain open during operation of the facility and that are not connected to a duct in which a fan is installed. An example of a natural draft opening is a slot where the base film (or "web") enters the total enclosure. The inward face velocity of the enclosure must be sufficient to overcome outward velocity due to dispersive forces. Because face velocity cannot be measured directly and accurately while the enclosure is in operation, the Agency has chosen to specify that an average face velocity be calculated using flow measurements in the forced makeup air ducts and the outlet ducts. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends minimum average face velocities of 2,700 to 3,600 m/h (150 to 200 ft/min) for enclosures around belt conveyors, bins/hoppers, and packaging machines, and through paint spray booths.[24] The Agency has selected an average face velocity of at least 3,600 m/h (200 ft/min) as the guideline for natural draft openings in total enclosures in this industry. A test procedure based on EPA methods is included in the compliance provisions of the promulgated regulation for determination of the average face velocity across the natural draft openings.

It is expected that most enclosures can easily meet this guideline. For instance, the "typical" model coating operation developed by EPA for impact analyses prior to proposal coats a web that is 0.66 m (26 in.) wide. This facility would need a net exhaust from the enclosure of only 0.30 standard m^3 per second (m^3/s) (650 standard cubic feet per minute [ft^3/min]) to maintain an average face velocity of 3,600 m/h (200 ft/min) across entrance and exit web slots measuring 1 m by 0.15 m (39 in. by 6 in.). This can easily be accomplished with the exhaust from the drying oven to the control device, which is expected to be on the order of 2.6 standard m^3/s (5,500 standard ft^3/min). In the event that an enclosure does not meet this requirement, the owner or operator can apply to the Administrator for approval on a case-by-case basis.

When the static pressure inside the enclosure is negative with respect to the static pressure outside the enclosure, an inward flow will result. However, the static pressure differential that results in an average face velocity of 3,600 m/h (200 ft/min) is so small (approximately 1 pascal [Pa] [0.004 inches of water {in. H_2O}] across a flanged opening) that motion near a natural draft opening could be enough to overcome this pressure differential, resulting in outward flow. For this reason, the requirements state that when the average face velocity is between 3,600 m/h and 9,000 m/h (200 ft/min and 500 ft/min), continuous inward flow must be verified during the determination of average face velocity by observation using smoke tubes, streamers, tracer gases, or other means approved by the Administrator. Above 9,000 m/h (500 ft/min), the average face velocity recommended by ACGIH when emissions are actively generated into a turbulent area, the static pressure differential is high enough (approximately 6.5 Pa [0.026 in. H_2O] across a flanged opening) that continuous inward flow can be assumed without verification.[24]

To differentiate a partial enclosure and a total enclosure, it is necessary to limit the size of any natural draft openings (e.g., web slots). The Agency has included requirements in the final rule that restrict the total area of the natural draft openings and the locations of such openings with respect to any source of emissions within the enclosure. The maintenance of a prescribed face velocity through a large opening or through an opening very near a source of emissions would not

ensure complete capture because of the increased possibility of localized airflow patterns such as backwash, channeling, and eddies that could carry VOC out of the enclosure. (There is no need to set size restrictions or minimum face velocity requirements for the forced makeup air ducts because the purpose of these ducts is to direct air into the enclosure, and sufficient face velocity will be maintained.) In addition, the frequency with which access doors into the enclosure are opened must be kept at a minimum.

The requirements based on these principles require that the total area of all natural draft openings not exceed 5 percent of the total surface area of the total enclosure's walls, floor, and ceiling. Any sources of emissions within the enclosure, such as the coater, must be at least four equivalent diameters away from each natural draft opening. (The equivalent diameter of an opening is four times the area of the opening divided by its perimeter.) Access doors must be tightly closed during process operation. Brief, occasional openings of such doors to accommodate process equipment adjustments are acceptable, but, if such openings are routine or if an access door remains open during the entire operation, the access door must be considered a natural draft opening. The average inward face velocity across the natural draft openings of the enclosure must be calculated including such access doors.

The requirements that natural draft openings comprise a maximum of 5 percent of the surface area of the enclosure's walls, floor, and ceiling is expected to be easily met. The smallest enclosure would be a small structure around the application/flashoff area coupled with the drying oven. Entrance and exit web slots measuring 1 m by 0.15 m (39 in. by 6 in.) would be natural draft openings totaling 0.3 square meters (m^2) (3 square feet [ft^2]). With these natural draft openings, an enclosure with a total surface area of 6 m^2 (65 ft^2) or more would meet the requirement. Any drying oven alone will exceed this surface area. Coating operations that require additional natural draft openings (e.g., access doors that are routinely opened) may not meet this requirement as readily with such a small enclosure. However, such facilities can be contained in a larger total enclosure in which operators remain during operation of the facility. The natural draft

openings in such an enclosure can easily be designed not to exceed 5 percent of the total surface area. In this configuration, the small enclosure immediately around the application/flashoff area would serve as a local ventilation system to ensure that the VOC concentration within the larger enclosure is maintained at safe levels. This larger type of enclosure also can readily be designed to comply with the requirements pertaining to distances between natural draft openings and VOC sources and to the opening of access doors. Alternatively, the owner or operator can gain approval of an enclosure that does not meet the requirements by demonstrating to the satisfaction of the Administrator that all VOC emissions from the coating operation are contained and vented to the control device.

Operation of the total enclosure also must be monitored. The final standards allow the owner or operator to select the most appropriate parameter to be monitored, subject to approval by the Administrator.

Based on the preceding discussion, the total enclosure definition; test procedure; and monitoring, recordkeeping, and reporting requirements described below have been added to the regulation.

1. Definition: A total enclosure is a structure that is constructed around a source of emissions so that all VOC emissions are collected and exhausted through a stack or duct. With a total enclosure, there will be no fugitive emissions, only stack emissions. The only openings in a total enclosure are forced makeup air and exhaust ducts and any natural draft openings such as those that allow raw materials to enter and exit the enclosure for processing. All access doors or windows are closed during routine operation of the enclosed source. (Otherwise they are considered natural draft openings.) The drying oven itself may be part of the total enclosure. A permanent enclosure that meets the requirements found in § 60.713(b)(5)(i) is assumed to be a total enclosure. (These requirements are discussed above.) The owner or operator of a permanent enclosure that does not meet the requirements may apply to the Administrator for approval of the enclosure as a total enclosure on a case-by-case basis. Such approval shall be granted upon a demonstration to the satisfaction of the Administrator that all VOC emissions are contained and vented to the control device.

2. Test procedure: All forced-air inlet ducts to the enclosure and exhaust ducts from the enclosure will be tested according to EPA Methods 1 or 1A and 2, 2A, 2C, or 2D (40 CFR 60 Appendix A). These measurements will be made to determine (1) the amount of air evacuated from the enclosure (or any component within the enclosure) and (2) the amount of forced makeup air entering the enclosure. By subtracting (2) from (1), the value of the net airflow into the enclosure through the natural draft openings is obtained. When this net airflow is divided by the total area of all natural draft openings, the value of the average face velocity is determined. These measurements also indicate whether the static pressure within the enclosure is positive or negative. When the net airflow is positive, the enclosure static pressure is negative with respect to the exterior.

3. Monitoring, recordkeeping, and reporting:

The owner or operator must submit a monitoring plan for the total enclosure along with notification of anticipated startup. The plan must identify the parameter to be monitored (e.g., the amperage of the exhaust fans or duct flow rates) and the methods for continuously monitoring the chosen parameter. All 3-hour periods during which the average monitor readings vary by 5 percent or more from the average value measured during the most recent performance test that demonstrated compliance must be reported.

2.5.2 Comment

One commenter (IV-F-1 [Haynes]) raised concerns about the technical feasibility, accuracy, and cost of conducting the performance evaluations under the gaseous emissions options, particularly at plants with many coating lines and multiple-bed carbon adsorbers. The commenter questioned the accuracy of measurements taken in a temporary enclosure around the coater. In addition, the commenter questioned the accuracy of using a gas chromatograph (GC) to measure the VOC concentrations of the multisolvent systems that are commonly used at magnetic tape manufacturing facilities. To be accurate, the GC would have to be calibrated with a standard gas, the organic content of which has a composition very near to that of the gas stream to be measured; however, the composition of the gas stream at a magnetic tape line can

vary over time. Changes in the type or ratio of organic compounds in the gas stream to be measured will introduce an error into the analytical results. This error will be increased if the airflow rate of the measured gas stream is large. The commenter also noted a problem in determining accurately the total VOC exiting a multiple-bed carbon adsorber because the VOC concentration in all the stacks would have to be measured and integrated over time to determine emissions from the recovery plant. In addition, the commenter said that, for the gaseous compliance tests, equipment would be required to shut down and purge sample lines automatically during desorption cycles to remove possible water vapor and air.

Response. The performance test using gas-phase measurements for determining compliance is based on two independent measurements that may be conducted simultaneously. One measurement is capture efficiency or the efficiency of the VOC collection and containment device(s) around the affected facility. The other measurement is the efficiency of the control device. The product of these two efficiency measurements is the total control system efficiency.

Capture efficiency is defined as the fraction of all gaseous VOC emitted from the affected facility that is directed to a control device. Mathematically, it is the quantity of VOC directed to the control device divided by the sum of that quantity and the fugitive emission losses. Control device efficiency is the difference in mass of VOC transported through the inlet and outlet streams divided by the mass of VOC transported through the inlet stream during the prescribed test period.

The measurement of capture efficiency is dependent on the ability to measure fugitive emissions. There are two methodological approaches. One approach would be to shut down all other sources of VOC that are located in the same room as the affected facility and continue to exhaust the fugitive emissions from the affected facility through the building ventilation system and other room exhausts such as ovens or roof fans. The preferred approach is to build a temporary enclosure around the coating operation and its VOC capture system and discharge the fugitive emissions through a common stack so that all fugitive emissions can be measured simultaneously at a single point.

A temporary enclosure built to measure fugitive emissions must be constructed and ventilated so that it has minimal impact on the performance of the permanent VOC capture system. A temporary enclosure will be assumed to achieve total capture of fugitive VOC emissions if it conforms to the requirements for a total enclosure discussed above and if all natural draft openings are at least four duct or hood equivalent diameters away from each exhaust duct or hood. (This requirement is included to avoid drawing air through a nearby natural draft opening directly into the exhaust duct or hood. This sort of "short circuit" could (1) dilute the SLA vented to the control device, (2) allow stagnant areas to develop within the enclosure where the VOC concentration might build up to unsafe levels, and (3) preferentially influence the face velocities across the natural draft openings. With a distance of four equivalent diameters or more between the exhaust ducts or hoods and the natural draft openings, these potential problems will be minimized. In nearly all cases, a temporary enclosure can readily be designed to meet this requirement.) Alternatively, the owner or operator may apply to the Administrator for approval of his temporary enclosure on a case-by-case basis. The development of this capture efficiency test procedure is ongoing. Additional guidance on the design of a temporary enclosure may be obtained as indicated above in the discussion of total enclosure requirements.

For the performance test, all emission streams including fugitive emissions must be transported through ducts or stacks suitable for conducting the gas-phase measurements of flow rate and VOC concentration. Once this requirement is met, every stream is subjected to the same battery of sampling and analytical tests. These tests are EPA methods that have been prescribed for compliance determinations in numerous other NSPS. The EPA has promulgated these methods with instructions for obtaining maximum accuracy and precision.

Method 25A utilizes a flame ionization analyzer (FIA), which must be calibrated prior to use by a reference gas. For maximum accuracy, the calibration gas should duplicate both the type and ratio of the VOC components of the stream to be analyzed. However, even if the composition of the measured gas varies from that of the calibration gas,

the calculated capture efficiency should be relatively unaffected. The same degree of change in the FIA response will occur for all streams of like composition and will, therefore, cancel in the ratios used to calculate the efficiencies. Another reason the variability of the VOC in the gas streams is not an issue is that the performance test will take place over a period of hours or, at most, days (not months). Therefore, any process variability should be avoided or anticipated and planned for prior to the performance test. Imprecision can be overcome with sufficient replications. Gas chromatography is not the required analytical technique for Method 25A, but the preceding arguments on the accuracy and precision of the FIA technique also would apply to the GC.

Methods 18 and 25 have been added as possible analytical techniques and for simultaneous and continuous measurement of VOC concentration in VOC emission streams. The proposed standards specified only Method 25A; however, this is not appropriate for all sites. In cases where the compositions of the streams to be measured differ markedly (e.g., the inlet and outlet streams of an incinerator), Method 18 or 25 will be more appropriate. A statement indicating which method will be used must be submitted to the Administrator for approval with the notification of the performance test.

The cost of Method 25A and the complementary methods for determining the gas flow rate will probably range from $6,000 to $10,000 per stack. The cost of Method 18 or 25 will be somewhat higher. The cost of a temporary enclosure will vary depending on the complexity of the site and the design of the fugitive emission exhaust system.

In response to the commenter's third concern, the presence of a multiple-bed carbon adsorber will not introduce significant error into the test results. The performance testing provisions in the promulgated standards require that test runs coincide with discrete adsorption cycles. Each bed of a multiple-bed system with individual exhaust stacks is to be tested individually. Equipment to shut down and purge sample lines automatically when a bed desorbs during a compliance test is not needed. Test crew personnel are always present at a sampling point and would shut down any sampling lines should it be necessary to

do so during a test. Also, a bed would not be desorbed in such a way as to direct the steam into the exhaust streams of the beds that are adsorbing. If residual humidity does pose a problem, drying agents can be used in the sample lines.

It is the Agency's determination that the test procedure described above and in the regulation provides an accurate means of determining compliance at a reasonable cost. In addition, each owner or operator has the option of selecting the alternative method of demonstrating compliance presented in § 60.713(b)(5), which is the installation of a permanent total enclosure and the ventilation of all emissions to a 95 percent efficient control device. Because owners or operators selecting this option must measure only total enclosure face velocity (see previous comment) and the control device efficiency, the cost of a compliance test is reduced.

2.5.3 Comment

One commenter (IV-F-1 [Haynes]) suggested that an alternative means of compliance for multiple coating lines ducted to a single solvent recovery system would be a solvent recovery efficiency based on a single plant-wide material balance. The level of control required by the SIP would be used to determine the baseline level of control to be applied to the solvent use as determined from current tankage and mix and coating equipment. The NSPS level of control would be used to determine allowable emissions from solvent use above that baseline level. The two levels of control would be combined to calculate the single plant-wide recovery efficiency value. Compliance would then be shown easily by records of solvent consumed, purchased, and discarded.

Response. The compliance method recommended by the commenter would require either that the test be applied to a group that includes both affected and nonaffected facilities or that the affected facility definition be changed to be the entire plant.

If the suggested compliance test were conducted at a plant with one affected coating line and multiple nonaffected VOC sources such as other coating lines, storage tanks, and cleanup, the material balance would probably not be sensitive enough to detect the effect of a change from 83 to 93 percent control of just the affected facility within the

plant. In addition, even if the method were sensitive enough, it would not be possible for the compliance officer to determine if the emission reduction occurred at the affected facility or at nonaffected sources.

Changing the affected facility definition would overcome these problems with the suggested compliance method. However, a narrow designation of affected facility is presumed by EPA to be the best choice because it ensures that the maximum possible number of modifications and reconstructions are brought under the standards of performance. If the entire plant were designated as the affected facility, the minimum capital investment that would be considered a modification for increases in production (about 15 percent of the total capital equipment value) or a reconstruction (50 percent of the capital cost of a comparable new facility) would be so large that most changes would not bring the plant under the proposed standards. Modifications are expected to be more common than construction of new lines in this industry (see Section 2.3). Of the modification scenarios submitted by industry, modifications to increase production were the most common. Thus, changing the affected facility definition to the entire plant would decrease the emission reduction achieved by the standards.

The suggested compliance method would not be capable of demonstrating that the required level of control is being achieved by the affected facility. Changing the affected facility definition to accommodate the compliance method would decrease the emission reduction achieved by the proposed standards. Therefore, a plant-wide material balance is not included as a possible compliance method.

2.5.4 Comment

One commenter (IV-D-3) suggested that a single standard of 90 percent control over the combined mix room and coating operation be offered as an alternative to the separate requirements for the coating operation (application/flashoff area and oven) and mix equipment. The standard would be based on percent reduction of the solvent entering the mix room. This alternative would simplify measurements and demonstration of compliance. In addition, metering of solvents is more accurate than metering of coatings, as would be required for a material balance around the coating operation alone.

Response. At most magnetic tape plants, mix equipment serves more than one coating operation. Thus, it would not be possible to perform a material balance starting at the mix room that would include only the affected facility because all the solvent entering the mix room during the month of the test would not be mixed in affected mix equipment or applied at the affected coating operation. Such a compliance method might be possible if all nonaffected coating operations were shut down for the month of the test; however, this method would be too great an interruption of production and would result in abnormal control device operation. Another way to implement the commenter's suggestion would be to define the affected facility as the mix equipment and all associated coating lines; this definition would result in virtually the entire plant becoming affected. For the reasons given in Comment 2.5.3, the Agency concluded that such a change in affected facility definition is not appropriate. The Agency decided that the level of the standard should not be decreased to 90 percent for the reasons presented in Comment 2.1.2. Because the suggested compliance method is not feasible given the affected facility definition and a level of control higher than 90 percent can be achieved, the regulation was not revised to be a single standard of 90 percent control across the mix room and coating operation.

2.6 REPORTING AND RECORDKEEPING REQUIREMENTS

2.6.1 Comment

One commenter (IV-F-1 [Sower]) stated that the implementation of the proposed standards would subject his company to an additional set of standards and a third agency to which to report data. The commenter believes that this reporting burden would be excessive and suggested that the intent of the proposed standards can be better accomplished by delegating the administrative duties to the existing State agencies.

Response. During the first 3 years of implementation, the average industry-wide labor burden of this NSPS was estimated to be 1.5 person-years per year, based on an average of 4.8 respondents per year. These burdens are considered by the Agency to be reasonable. Under Section 111(c) of the Act, EPA may delegate enforcement authority to a particular State. In cases where EPA delegates that authority and

approves the reporting requirements adopted by such State, the affected sources within the State may comply with the State requirements in lieu of the Federal requirements.

2.7 COST AND ECONOMIC ASSUMPTIONS AND IMPACTS

2.7.1 Comment

One commenter (IV-D-32) stated that the Agency has not adequately addressed the problems associated with the use of ketones by the magnetic tape industry. As stated by the commenter:

> "(We submit) that the considerable daily data provided in these supplemental comments--far in excess of anything currently in the record--demonstrate the problems caused by use of ketones. The Agency must focus on the environmental and cost impacts of the proposal on ketone users before the standards may be promulgated."

The commenter went on to imply that the variability in carbon adsorber performance is greater when ketones are present in the SLA stream and to state that ketones shorten the useful life of the carbon in adsorption systems, resulting in greater cost impacts attributable to the NSPS than indicated by the cost analysis carried out by EPA prior to proposal.

Response.

Summary. As a result of this comment, the Agency sought additional information on the effect of ketones in the SLA delivered to a carbon adsorber. Based on responses by designers of carbon adsorber systems, carbon manufacturers, and operators of adsorber systems, the Agency agrees that ketones are somewhat unique in that they appear to accelerate fouling and can cause elevated temperature in an adsorption bed. However, neither of these problems would cause extreme variability in the efficiency of an adsorber from cycle to cycle, and carbon adsorbers are commonly used at magnetic tape facilities that use ketones.

Accelerated fouling would decrease the working capacity of a carbon bed, shorten the productive adsorption cycle, and, if the cycle change is initiated by time interval, result in an apparent rapid degradation in the recovery efficiency of a carbon bed. (A more thorough discussion of this misinterpreted phenomenon is presented in the earlier response to Comment 2.1.2.) If the adsorber is properly operated, however,

recovery efficiency still can be maintained above 95 percent. The accelerated fouling will reduce bed life and increase recovery costs somewhat above those experienced for other organics. Nevertheless, the cost effectiveness of the NSPS relative to the baseline control level (that required by typical SIP's) is reasonable even when accelerated fouling occurs.

Elevated temperatures in the bed can occur because of the exothermic reaction ketones undergo on the surface of the carbon. However, in a properly designed, operated, and maintained system, the heat generated in this manner would not be expected to contribute to a cycle-by-cycle variation in efficiency or bed-to-bed variation in bed life.

Presented below is a more detailed discussion of the effect of fouling and elevated temperatures on the efficiency and cost of adsorption control.

Details.

Accelerated fouling. Some ketones (particularly cyclohexanone) will react on the surface of the carbon, forming large molecules that are difficult to desorb. The result is an incremental reduction in the working capacity of the carbon which, when added to the normal decay of working capacity, can significantly reduce the effective life of a carbon. It is believed by some that use of "low ash" carbon will minimize this polymerization.[25-26] Low ash carbon contains little of the inorganic minerals (e.g., iron) that are believed to catalyze the reaction.

In a system where accelerated fouling occurs, the bed life will be a function of the rate of fouling and the capacity initially designed into the system. Although the exact mechanisms of rapid fouling are poorly understood, the rate is probably dependent on the type and quantity of organic in the SLA stream, the regeneration procedures, and the type of carbon. Reports by this industry of bed lives as brief as 3 to 18 months when ketones are used indicate that the fouling rate is indeed greater than commonly encountered when other solvents are used.

There is some indication that the increased fouling rate may not be wholly attributable to ketones. One manufacturer that controls his mix

room by drafting the mix tanks to the adsorber has experienced fouling as a result of entraining the magnetic medium (iron oxide) into the draft to the carbon system during additions of the medium to the mix tank.[27] The oxide could have a dual adverse effect, physically plugging the carbon and catalyzing the polymerization of the ketones.

Regardless of the cause, the rate of fouling need have little or no effect on the operational efficiency achievable by a properly designed and operated adsorber. Figures 2-6 and 2-7 present the inlet and outlet concentrations of a typical multiple-bed carbon adsorber system shortly after new carbon has been added and again shortly before time for the carbon to be replaced. These two events will occur at more frequent intervals if the bed fouling is accelerated, but the rate of fouling is not a determinant of efficiency, as the subsequent discussion will illustrate.

For illustration purposes, it will be assumed that the multiple-bed system consists of only two adsorption beds. It is not uncommon for large adsorption systems to consist of three or more vessels. Such configurations can add flexibility to the operation of the system. However, the factors that determine bed life remain the same and are adequately represented by a two-vessel example.

At any time, only one vessel of a two-vessel system is on line operating in the adsorption mode. The other is undergoing regeneration. For purposes of this example, it is assumed that the time required for regeneration of an adsorber vessel is 60 minutes. This includes the hot desorption cycle and the cooling/drying cycle. In a well-designed system, desorption is conducted by a countercurrent flow of steam through the carbon bed. The duration of steaming and the steam temperature are determined based on desorption of the maximum quantity of the most difficult-to-desorb solvent. The conditions provided during the cooling/drying cycle must return the carbon bed to the design temperature and moisture content.

For this example, each bed has been sized to assure a working capacity which will permit a 90-minute adsorption cycle during conditions of maximum solvent loading. Each bed is equipped with a monitor so that the adsorbing vessel can be removed from service (and

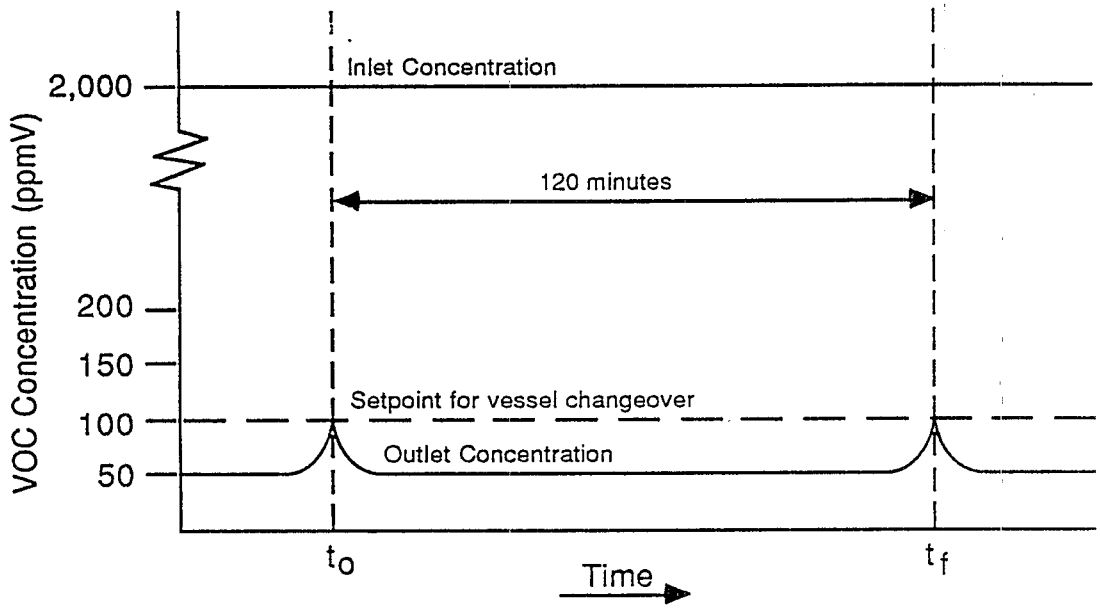

Figure 2-6. Tenth adsorption cycle with new carbon.

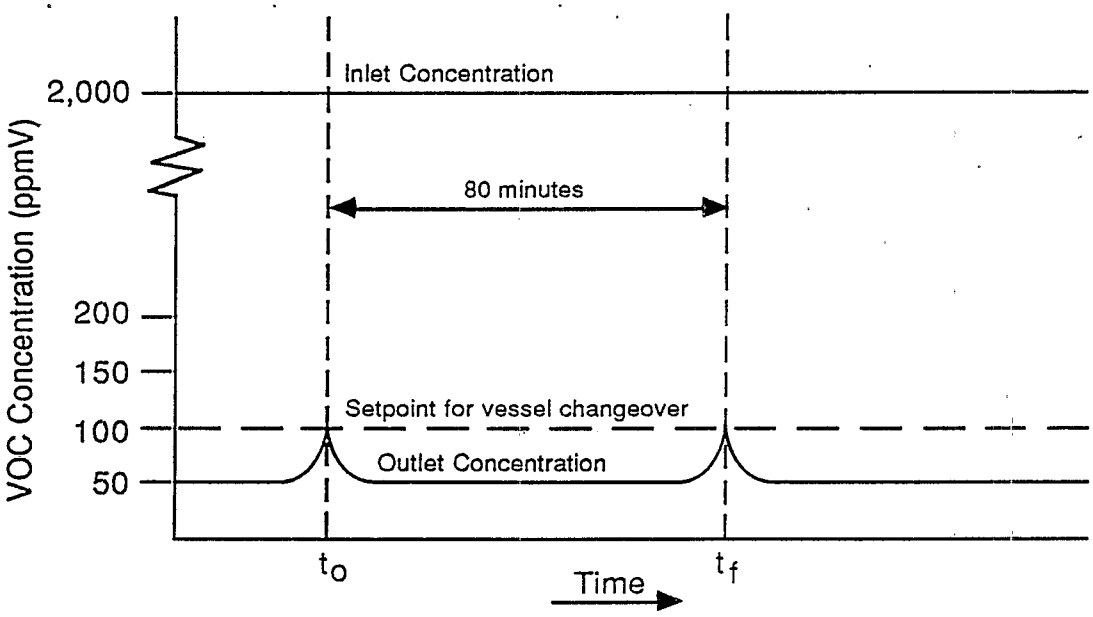

Figure 2-7. Last adsorption cycle prior to carbon replacement.

replaced by the regenerated vessel) when the outlet VOC concentration climbs to a predetermined level, in this example, 100 ppmV. The vessel removed from service is then regenerated. It is assumed that the volumetric flow rate of the SLA stream is constant, that the maximum VOC concentration is 3,000 ppmV, and that the typical VOC concentration is 2,000 ppmV.

In Figure 2-6, the inlet and outlet concentrations are plotted against time for the tenth adsorption cycle of a vessel that has been recharged with new carbon. (The first few cycles are not representative of normal performance because carbon requires a few cycles to equilibrate.) The carbon bed was designed for a 90-minute adsorption cycle when the inlet VOC concentration is 3,000 ppmV. With an inlet concentration of 2,000 ppmV, the same mass of VOC would be vented to the adsorber over 135 minutes. However, the working capacity will be slightly diminished because of the lower inlet VOC concentration, so the adsorption cycle will be greater than 90 but less than 135 minutes.

Figure 2-6 represents this adsorption cycle of approximately 120 minutes (the exact length is not critical for this example). The short period of elevated outlet concentration at the beginning of the adsorption cycle may be the result of incomplete cooling and drying of the carbon bed after steam desorption or, if there is a common discharge manifold for both vessels, may be the result of the inability of the monitor to distinguish between the outlet concentrations of the vessel going off line and the vessel coming on line. Although it is avoidable, this period is included in this example because it is typical of actual adsorption system operations. For ease in calculations, simplifying assumptions were made about the maximum outlet VOC concentration at the beginning and end of the adsorption cycles of successive beds. They are assumed to be symmetrical about the changeover points, to have a duration of 10 minutes from start to finish, and to change value at a linear rate (have straight sides). Averaged over the 120-minute adsorption cycle from t_0 to t_f, the efficiency of the system illustrated in Figure 2-6 is 97.4 percent. If the averaging period is extended to 130 minutes in order to include the excursion in outlet concentration during both vessel changes (a worst-case measurement of efficiency), the efficiency declines only marginally to 97.3 percent.

In Figure 2-7, the performance of the same system is illustrated for the last adsorption cycle of the carbon bed's useful life. If only normal fouling of the carbon bed has occurred, the activity of the carbon will have been degraded by oxidation and physical wear over a period of up to 5 years or more. If rapid carbon fouling related to ketone use (or other site-specific causes) has occurred, it is likely to have accelerated the degradation to 18 months or less. At the time depicted, the capacity of the carbon is assumed to have been reduced to the point that breakthrough occurs after only 60 minutes of operation at the maximum inlet concentration (3,000 ppmV) under the most extreme conditions that may be encountered. Because the minimum length of the adsorption cycle is now equal to the time required to desorb the other adsorber, working capacity can be permitted to decline no further, and the useful life of the carbon is about over. Notice, however, that the outlet concentration during the bulk of the adsorption cycle remains constant at about 50 ppmV. The decreased working capacity with attendant diminished adsorptive capacity has not affected outlet conditions as explained in more detail in Comment 2.1.2.

Based only on mass loading, the vessel can now remain onstream for a maximum of 90 minutes at an inlet concentration of 2,000 ppmV. (Figure 2-7 assumes 80 minutes.) Using the same logic discussed earlier, the efficiency of the adsorption system over this period is calculated to be 97.3 percent. If the averaging period over which the efficiency is calculated is increased by 10 minutes (5 minutes earlier and 5 minutes later) to include 100 percent of the excursions of outlet concentrations during two bed changes (worst case), the calculated system efficiency is 97.2 percent.

The performance test runs and monitoring data averaging periods in the promulgated NSPS are required to coincide with complete adsorption cycles. Thus, 97.3 percent would be the minimum efficiency measured for this example system under the final standards. If this system were operated to switch adsorber vessels at an outlet concentration of 500 ppmV, the worst-case efficiency at the time represented in Figure 2-7 would be 95 percent. This example, which is based on proper adsorber design, operation, and maintenance, makes clear that a carbon adsorption

system can operate continuously with almost any desired efficiency over the entire life of the carbon.

Cost Impacts of Accelerated Fouling. Although reduced bed life need not affect the efficiency achieved by a properly designed and operated carbon adsorption system, it will affect the cost of operating the system. When the bed life is reduced, the annualized cost of carbon replacement will increase. As explained in the following discussion, essentially the same amount of cyclohexanone will be vented to the adsorber under the regulatory baseline (the typical SIP) as under the NSPS, so the reduction in bed life (and attendant increase in control costs) will also be the same in both cases. Thus, the cost effectiveness of the NSPS relative to the baseline regulation is not changed directly by the use of cyclohexanone.

However, as suggested by the commenter, the bed life may be reduced slightly under the NSPS relative to the baseline regulations. This effect can be examined in two ways, as discussed below.

The first approach is that of EPA's preproposal cost analysis. In that analysis, a carbon adsorber efficiency of 95 percent was assumed for both the baseline and the NSPS control levels. The difference in the overall control levels achieved by the two alternatives was assumed to result from greater capture efficiency achieved in the NSPS case by containing tha emissions from the application/flashoff area that would be emitted to the atmosphere in the baseline case. The increase in the mass of VOC vented to the adsorber under the NSPS as a result of increased capture efficiency (a maximum of about 10 percent) would be expected to reduce carbon bed life slightly through a small increase in the rate of fouling and a proportional reduction in the length of the adsorption cycle prior to breakthrough.

The carbon fouling effect on the bed life would not be great. For those plants that use cyclohexanone, no appreciable change in the fouling rate would occur. The increase in the organic flow rate to the adsorber would be comprised primarily of the faster evaporating solvents such as methyl ethyl ketone (MEK) (with an evaporation rate of about 3.8 relative to n-butyl acetate = 1.0).[28] Cyclohexanone, which is by far the "worst actor" in accelerated fouling, has a very slow evaporation rate of about

0.2, which is almost 20 times slower than MEK.[28] Increasing the capture efficiency in the application/ flashoff area would result in very little, if any, increase in the capture of cyclohexanone, which evaporates primarily in the oven. The contribution to the overall fouling rate from the increase in the mass of other compounds reaching the adsorber likely would not be noticeable. Consequently, the NSPS will result in little or no increase over the baseline conditions in the rate of accelerated fouling. Where cyclohexanone is not used, the rate of fouling might increase slightly, depending on the identity of the fouling component(s) and the point(s) of generation in the coating process. The relatively high vapor pressure compounds captured in the application/flashoff area will normally contribute very little to the fouling rate.

The second effect of an increased mass flow rate to the adsorber is a reduction in the length of the adsorption cycle prior to breakthrough. In all carbon adsorption systems, the carbon gradually loses capacity with use, and the length of the adsorption cycle prior to breakthrough decreases. The carbon must be replaced when the adsorption cycle reaches the minimum acceptable length. Thus, the starting point of the process, the initial length of the adsorption cycle with fresh carbon, is critical in determining the bed life. The reduction in the initial length of the adsorption cycle due to increased capture under the NSPS would be expected to be approximately proportional to the increase in the mass flow rate, in this case, about 10 percent. The absolute magnitude of the reduction will depend on the design of the system but normally will not exceed several minutes. In a well-designed system, such a change will represent only a small fraction of the difference between the initial length of the adsorption cycle and the minimum acceptable length. The combination of this effect and the minimal increase in the rate of fouling will result in only a small reduction in bed life.

The commenter implied that the difference between the NSPS and baseline control levels lies not in capture efficiency but in the efficiency at which the adsorption system is operated. Under this scenario, the capture efficiency would be constant under baseline and NSPS control situations, but the efficiency of the adsorber would have to rise from 85 percent at the baseline to 95 percent under the NSPS.

This scenario, like the one discussed above, would result in a slight decrease in the carbon bed life. The use or nonuse of cyclohexanone has no bearing on this fact; the same quantity of cyclohexanone would reach the adsorber under either of the control options. In addition, the total mass flow rate to the adsorber of all compounds would be identical in the two cases, so the effects discussed above would not occur. However, operation at a higher control efficiency (95 percent) would require that the adsorption cycle be ended earlier than if operation were at a lower efficiency (85 percent). This would reduce the initial length of the adsorption cycle with fresh carbon, and the bed life would be reduced correspondingly.

The exact magnitude of the reduction in cycle length would be determined by a number of site-specific conditions. However, the majority of emissions over the course of a carbon bed's adsorption cycle occurs at the end of the cycle as the solvent front begins to break through the bed. The emission rate rises very rapidly at this time. Thus, the length of an adsorption cycle over which 95 percent efficiency is achieved would be, at most, a few minutes shorter than an 85 percent efficient cycle. With a properly designed, operated, and maintained system, this would result in only slightly more frequent carbon replacement, and the bed life reduction would be small.

The cost-effectiveness implications of the small bed life reduction under the NSPS relative to baseline regulations were analyzed using the "typical" model line (developed for the preproposal cost analysis), which more closely approximates the commenter's situation than do the other model lines that were developed by EPA. The cost effectiveness of the NSPS is least favorable in cases where accelerated fouling of the carbon has already significantly reduced the bed life. Thus, the baseline case used for this analysis was a system with a 12-month bed life and an overall control efficiency (combining capture and control device efficiencies) of 83 percent. The incremental annualized control cost (including solvent recovery credits) of the NSPS for the typical model coating operation with a 6-month bed life was found to be a net credit.[29] The commenter's scenario also was analyzed for other model lines and cases where accelerated fouling does not occur, and the costs were found to be reasonable.[29]

The Agency believes that an adsorption system that has been designed, operated, and maintained adequately for the ketone SLA stream to which it is exposed will be able to meet the NSPS while operating with the same carbon bed for 6 months. As explained earlier, adequate capacity can be designed into the system to accommodate any desired bed life. For those systems with bed lives shorter than 6 months, the Agency has concluded, based on the available data, that these systems are underdesigned or poorly operated or the beds' useful lives are heavily influenced by blinding from particulates in the inlet stream.[27,30]

Elevated Bed Temperature. It is recognized that under certain circumstances the presence of ketones in the SLA presents the potential for the development of "hot spots" in the carbon bed. If ignored, these areas of elevated temperature could pose a threat to the efficiency of an adsorption system.

Certain ketones can react exothermically on the surface of the carbon bed. Under normal circumstances, the airflow will carry the heat from the bed with no discernable effect with bed's operation. If, however, there is poor flow distribution within the adsorber vessel, the heat can increase and, in the extreme, actually ignite the carbon.

According to the largest domestic manufacturer of activated carbon, the poor flow distribution necessary for the development of a hot section within a carbon bed is almost always a consequence of poor design.[9] The inlet to the adsorber bed has not been properly baffled to assure uniform distribution of the inlet SLA. As a result, any effect of the hot spots, such as early breakthrough, would be present from startup of the adsorber and would certainly not occur in an erratic or intermittent fashion.

Bed fires are most likely to occur when the system is restarted after a period of downtime (such as a weekend), and then only if ketones are not properly purged from the system prior to shutdown. In such a case, the exothermic reaction will continue while the system is inoperative but cannot ignite the carbon because there is insufficient oxygen. When the system is restarted and the SLA stream contacts the hot carbon, combustion can begin. Such a fire would be considered a malfunction as defined in the General Provisions.

In summary, while the presence of ketones in an SLA stream can affect the operation and adsorption cycle of a carbon adsorber, the adsorption efficiency need not decline in a properly designed and operated system.

Alternatives to Exclusive Use of Carbon Control. As the discussion above indicates, ketones (particularly cyclohexanone) in the SLA stream can affect the useful bed life of an adsorption system. Although a reduced bed life need not affect the efficiency achieved by the system, it will affect the operating costs. The incremental cost effectiveness of the NSPS relative to the baseline control level is reasonable. However, the cost of meeting any standard will increase with a shorter bed life. For this reason, sources which use ketone solvents might consider other control alternatives. In the original cost analysis, the Agency examined the costs associated with the use of a condenser at a magnetic tape manufacturing facility and found them reasonable. Another approach would be the use of a device upstream from the carbon adsorber which would remove all or part of the organic in the SLA stream that reduces bed life. A condenser or scrubber might be appropriate, depending on the VOC content of the stream. Another option may be to change the coating formulation to reduce or eliminate the problem solvent. If fine particulate matter is the cause of reduced bed life, filters can be used.

Carbon adsorption is a very useful technology that can be applied in a wide variety of situations. However, other available control technologies may be less expensive.

2.7.2 Comment

Several commenters (IV-F-1 [Carlson, Fischer, Sower], IV-D-3, IV-D-4, IV-D-5, IV-D-6, IV-D-32) noted that EPA's projections of growth in the industry (21 new lines by 1990) are out-of-date and that, in fact, 17 or 18 lines have been shut down, retired, or put on standby since the National Air Pollution Control Techniques Advisory Committee meeting (IV-F-1 [Carlson]). The commenters claimed that because so many lines are no longer in operation, VOC emissions from this industry have decreased, and there is no longer a need for the NSPS.

Another commenter (IV-D-28) presented the results of an independent survey of magnetic tape manufacturers, which indicated that most lines affected by the standard will be modified or reconstructed lines rather

than new lines as asserted by EPA at proposal. The survey concluded that significantly more facilities would become subject to the NSPS than the 20 estimated by EPA.

Response. The Agency has confirmed that there are several lines that are not currently in operation. However, these shutdowns do not prove that there will be no affected facilities in the next 5 years. In fact, as stated by commenter IV-D-28 and by industry representatives at the public hearing, there will be modifications to existing lines that would cause additional lines to become subject to the proposed standards (see Section 2.3). Also, at least one new facility has been announced, and other firms have made inquiries of EPA that suggest additional new facilities are under serious consideration. Following the public hearings, six modification scenarios were provided by industry (see Section 2.3). The EPA determined that three of these are likely to meet the criteria given in 40 CFR 60.14 and would be actual modifications. The EPA conducted its own survey of the industry for information on plans to construct new lines or modify existing lines.[19]

Based on this new information, the projected number of coating lines to become affected by the fifth year of applicability (1991) has been revised downward from 21 to 16. Of these, 5 will be new and 11 will be modified or reconstructed. However, one new line and two modified lines will fall below the applicable minimum annual solvent utilization cutoffs and, thus, would not be required to control emissions under the promulgated NSPS. In addition, under the promulgated standards, two of the modified and reconstructed coating operations are not expected to be required to increase control efficiency. In summary, 16 affected lines are expected in the next 5 years, of which 11 will be required to increase their level of control; the remaining 5 lines will be subject only to monitoring and reporting requirements.

Although several firms have exited from the industry in recent years because of depressed market conditions, other firms in the industry are engaged in improving their existing technology and expanding production to reduce their production cost. Interestingly, most of the projected affected facilities represent modifications designed to increase the production capacity and line speed of the production line. The increased

interest in modification of existing lines is a response to the highly competitive environment in the magnetic tape industry where survival depends upon reducing production costs. While the entry of new firms or the construction of new lines are not likely because of prevailing market conditions, the modification of existing lines to reduce production costs and remain competitive are sustaining forces which are reflected in the market. The reduction in nationwide VOC emissions due to the standards in the fifth year after promulgation is expected to be about 960 Mg (1,060 tons). Thus, the decline in the number of plants manufacturing magnetic tape does not negate the need for the NSPS.

The Agency believes that the current growth projection is reasonable based on the information at hand. Of course, economic conditions are always changing, and industry growth patterns will change concurrently. While future changes may result in impacts somewhat different from those now estimated, this NSPS is expected to remain cost effective with reasonable economic impacts even in the face of these changes.

2.7.3 Comment

Three commenters (IV-F-1 [Carlson, Zosel], IV-D-5, IV-D-6) noted that industry-wide emissions have not increased as projected in the Volume I BID; instead, industry has reduced VOC emissions as a result of increasing the packing density of information bytes and/or reducing coating thickness (and solvent consumed) per unit of tape produced. One commenter (IV-F-1 [Carlson]) stated that because decreased emissions have resulted in decreased cost effectiveness, the costs of controls should be reevaluated.

Response. No data have been received supporting the contention that VOC use per unit of tape has decreased. However, even if this is the case, total VOC emissions from the industry may not decrease. According to industry representatives, some new lines will be built and modifications of existing lines will occur in this industry. Of the modification scenarios received, the most common is an increase in production (see Comment 2.3.4). Thus, any decrease in VOC use per unit of tape may be offset by increased tape production.

In any case, a net decrease in emissions from this industry would not negate the impact of the NSPS. Construction of new lines and modification of existing lines will bring about 16 lines under the standards in the

next 5 years (see Comment 2.7.2), and the level of control of 11 of these lines will be raised from the baseline of 83 percent to 93 percent. In addition, the proposed NSPS included an annual solvent use cutoff below which the cost to install a control device is not reasonable. This cutoff was discussed at proposal and has been retained for new coating operations. A higher cutoff has been added for modified or reconstructed coating operations. Thus, the evaluation of control costs for lower VOC emission rates has already been performed and the Agency does not need to perform another evaluation.

2.7.4 Comment

Two commenters (IV-F-1 [Ford]), IV-D-5) stated that the economic assumptions and forecasts contained in Chapter 9 of the Volume I BID are not representative of the economic situation and price competition faced by the domestic magnetic tape manufacturing industry today. One commenter (IV-F-1 [Ford]) was particularly concerned that the references in Chapter 9 are not more current than 1983 and requested that the economic assumptions and forecasts be reevaluated prior to promulgation of the standard. Another commenter (IV-D-13) stated that the proposed NSPS will have a negative impact on the domestic magnetic tape industry.

One commenter (IV-D-28) contended that, contrary to EPA's position, the regulation would have negative economic impacts. The commenter disagreed with the Agency's conclusion that solvent recovery credits would more than offset the NSPS compliance costs, creating a net cost savings. The commenter's own survey of eight plants indicated that savings in new solvent purchases resulting from recovery and reuse of spent solvent from the incremental VOC controls necessitated by the NSPS were not sufficient to offset the total annualized costs of the proposed regulation. Thus, the commenter concluded that the regulation would create net compliance costs for the industry.

Response. The economic impacts of the promulgated NSPS have been recalculated since proposal using information received from industry and current market prices. This recalculation has resulted in revised impacts but no change in the conclusion that the economic impacts are negligible. The actual impacts may differ from those now estimated as a result of the ever-changing economic climate. These changes are not expected to

alter the conclusion that the standards will have negligible economic impacts.

Generally, new coating lines subject to the NSPS will experience a savings due to solvent recovery credits. An exception exists for small lines for which these credits may not completely offset the cost of control. As a result, an annual solvent use cutoff of 38 m^3 has been established below which coating operations are subject only to recordkeeping and reporting requirements. This cutoff was discussed in the proposal preamble and has been retained in the promulgated standard. For small coating lines above this cutoff, the actual and relative cost increases are insignificant compared to the current production costs and retail prices. If all cost increases were passed through to the consumer, the retail price increase is predicted to be less than 0.5 percent.

Modification or reconstruction of coating lines typically results in increased production and, thus, reduced production costs. However, because these changes may also increase emissions, additional control costs will be incurred that will offset some of the reduction in production costs. To evaluate the probable production cost and price impact of added controls on modified lines, the Agency analyzed several different cost and production line modification scenarios that were submitted by industry. Because of the limited data provided and its confidential nature, it was not possible to analyze the direct effect of compliance with the NSPS on actual production costs after modification. It was only possible to calculate the change in control costs that would result from the regulation and estimate the impact of these costs on retail prices. For the four different products manufactured at the plants that provided information, the average per-unit control cost increases range from less than \$0.01 to \$0.06.[31] As a percentage of retail prices, the resulting cost increases represent less than 0.5 percent. Such increases are not expected to have a significant adverse effect on the industry.

2.7.5 Comment

One commenter (IV-D-28) pointed out that this decade has brought dramatic changes to the magnetic tape industry. The domestic industry's market share has fallen, while the retail price of tape has declined sharply. The combination of these two factors has caused retail price to

become a key factor in this competitive industry with the result that retail price is much less elastic now than it was a few years ago. This fact makes it difficult for domestic producers to pass on to their customers price increases necessitated by the NSPS. Any increase in retail price places domestic producers at a disadvantage to the foreign competition and increases the foreign share of the market. The commenter stated that, because offshore facilities are subject to less environmental regulation than those in the U.S., driving the industry offshore would also result in a net detriment to the environment.

Another commenter (IV-D-4) concurred that an already shrinking margin of profit would be reduced further by foreign competition that is not subject to the regulations and that the proposed regulations would accelerate the trend of exporting coating lines offshore. A third commenter (IV-F-1 [Carlson]) noted that foreign competition would not be subject to the limits on technological innovation as would domestic manufacturers subject to the proposed standards, while a fourth commenter (IV-D-20) stated that his company would build a new line offshore rather than add further control on an existing line modified under the proposed NSPS.

Response. Foreign competition is an important element in the magnetic tape industry. During recent years, depressed market prices have discouraged the domestic development of new production lines or the entry of new firms in the industry. Lower prices also have encouraged the exit of other firms from the industry and the modification of existing lines to reduce production costs.

Because the NSPS has an insignificant impact on new lines and has little impact on production costs, it is doubtful that the NSPS for new lines would disadvantage U.S. producers relative to their competitors. With modified lines, some additional control costs may have to be incurred, but even these are insignificant and the other production cost reductions obtainable from modifications are expected to far outweigh any additional cost of the added controls. In addition, recent changes in the foreign exchange rates that would tend to discourage imports and encourage U.S. exports should improve the competitive position of domestic producers.

Environmental regulations are only one of the many factors that must be weighed in determining the comparative advantage of one country over another in the production and marketing of products in international markets. Based upon the evidence to date, however, the economic impact of the NSPS on the ability of domestic producers to compete in the international market is negligible.

Most of the companies in this industry are large multinational companies with annual revenues and assets in excess of $1 billion (Table 9-13 pp. 9-27 and 9-28 of Volume I BID). These companies each have a minimum of several hundred million dollars of long-term debt. Even the most costly investment for new or modified lines would not increase the debt loadings of the companies by more than 1 percent. Furthermore, with the recent decrease in interest rates, a greater supply of investment funds at lower cost is now available, thus improving the affordability of new investments.

The promulgated standards do not affect or limit technological innovation. All products known to be manufactured in the magnetic tape industry can be coated in a total enclosure. The use of a total enclosure does not affect coating composition or necessitate changes in other aspects of the production process.

The combination of the factors discussed above indicates that the cost to comply with the NSPS would not drive the industry offshore.

2.7.6 Comment

A commenter (IV-D-28) representing an industry trade organization submitted information on an independent survey of the magnetic tape manufacturing industry. Survey forms were sent to 12 companies that indicated a willingness to participate, and six of these firms, representing eight plants, responded. The information included an economic impact analysis of the proposed NSPS that was based on the survey results. The major conclusions drawn by the commenter from the results of this survey and analysis that are not discussed elsewhere are presented below.

The commenter stated that the NSPS would result in significant costs in the form of increased VOC control expenditures and reduced investments in innovations designed to enhance economic productivity. Based on extrapolation of survey findings, the commenter estimated that cumulative

capital costs would total $38.1 million industry wide through 1991, with associated net annual operating costs reaching $2.6 million in 1991. Thus, the commenter estimated total annualized costs (annualized capital costs plus operating costs) of $9.2 million in 1991. The commenter also contended that the NSPS would not pass EPA's criterion of cost effectiveness in 4 of the 5 years subject to analysis. The commenter estimated the fifth year (1991) annualized cost per ton of VOC emission reduction to be $1,816 for 2,452 total estimated tons of reduced emissions. This value is higher than the value alleged by the commenter to be the maximum criterion used by EPA for NSPS ($1,075 per ton). Furthermore, the commenter stated that, because nearly all of the anticipated reduction in emissions resulting from the NSPS is expected to occur in areas that have already attained EPA's ambient air standards, the reduction would be less valuable in terms of environmental benefit.

The commenter believed the survey results demonstrated the potential for significant impacts in the form of financial hardship for domestic plants (if costs are not passed on to the consumer) and reduced international competitiveness (if costs are passed on to the consumer). If the increased costs are absorbed by the industry, the commenter felt that the regulation would have an adverse impact on profitability and investment potential. If, on the other hand, the increased costs are borne by the consumer in the form of higher prices, this would result in smaller market shares and fewer jobs for the domestic industry. The commenter concluded that in either case, there are significant factors that fall within the definition of "major rule" in Executive Order 12291, and questioned EPA's position that the proposed rule is not a major rule.

Response. As indicated in the response to Comment 2.7.2, EPA has conducted a new survey of the growth plans in this industry since the time the regulation was proposed. This survey agreed with the survey conducted by the commenter in that, over the next 5 years, there is likely to be more modification or reconstruction of existing lines than construction of new lines. Subsequently, a new cost analysis was carried out which resulted in a change in the levels of control required for some modified and reconstructed coating operations and for most mix equipment (see Section 1.1 and Section 2.3). The revised NSPS takes into account the

greater expense of retrofitting modified or reconstructed facilities. Because the commenter's economic analysis was based on the proposed standards and not on the revised ones, the results of the commenter's analysis are no longer applicable. Not enough data were submitted to allow a determination of whether the changes included in the commenter's analysis would legally qualify as modifications and reconstructions, whether the incremental control measures and costs claimed to be required were realistic, or what effect the revisions to the standards would have. Because the commenter's study did not raise any significant new concerns that were not addressed by the revisions already made to the standards, it was determined that the level of effort required to verify the costs and adjust the survey results to reflect the revised NSPS was not justified. The Agency's new economic analysis, based on the revised NSPS, indicates that the standard is cost effective and will result in an industry-wide net credit of $32,000 per year in 1991.

The Agency does not agree with the commenter's allegation that the anticipated emission reductions due to the NSPS are environmentally less valuable simply because they are expected to occur primarily in attainment areas. The cost-effectiveness value considered reasonable for an NSPS for this industry ($1,200/Mg [$1,100/ton]) was determined in the context of a national standard for an entire class of sources without consideration of local air quality conditions. Thus, when source-specific air quality and related public health considerations are important factors (e.g., in nonattainment areas and in prevention of significant deterioration [PSD] permitting activities), the cost-effectiveness value that would be considered reasonable would be expected to exceed the value determined for the NSPS program (see Comment 2.8.2). Also, VOC emitted in some attainment areas can be transported to nonattainment areas, adding to the air quality problems experienced there.

The EPA maintains its position that this rule is not a major rule based on the three criteria required to meet this classification. First, the new economic analysis conducted by the Agency has verified that industry-wide annualized costs are less than $100 million. As previously stated, it is estimated that the standard would result in a net credit of $32,000 per year in the fifth year. Secondly, the revised economic

analysis showed that no significant increase in retail price is expected as a result of the standard; therefore, it would not be considered a "major increase in costs or prices" as specified in the second criterion in the Order (see Comment 2.7.4). Thirdly, the revised economic analysis 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 (see Comment 2.7.5).

In summary, since proposal of the standard, the Agency has considered the higher costs of retrofitting modified or reconstructed facilities to comply with the standards, and revised the regulation accordingly. Even assuming the increased control costs of the NSPS presented in the commenter's study and the decreased prices and competitive market conditions facing the industry are applicable, the conclusion that the proposed rule is not a major rule is still correct. Using the commenter's estimates, the costs to the industry that result from the regulation ($9.2 million total annualized costs) are considerably less than the $100 million criterion, and the subsequent production cost and product price increases, assuming full costs are passed through to the consumer, remain small. Consequently, the net impact of the regulation on the domestic industry's ability to compete is also likely to be minimal.

Based on the data presented in the commenter's study, percentage increases in retail product prices were calculated.[32] These calculations indicate that increases in retail prices of less than 1 percent would occur for most products and scenarios (maximum price increase of 1.52 percent) if all costs are passed through to the consumer. This illustrates that, even assuming the commenter's data are still applicable under the revised regulation, the cost and price effects of the NSPS are relatively insignificant.

2.8 SUSPENSION OF THE STANDARDS

2.8.1 Comment

Four commenters (IV-F-1 [Zosel], IV-D-5, IV-D-6, IV-D-32) questioned the need for an NSPS for the magnetic tape industry and suggested either that the NSPS be suspended pending a thorough reevaluation or rescinded. This argument is based on the decrease in VOC emissions due to fewer coating lines and thinner coatings, the reduced growth projected for the

industry, and the relatively small share of total national VOC emissions originating from magnetic tape manufacturing facilities (see Comments 2.7.2 and 2.7.3).

Response. Because the magnetic tape manufacturing industry is a subcategory of the industrial paper coating industry, which is ranked fourth on the NSPS Priority List (40 CFR 60.16), the Clean Air Act authorizes EPA to promulgate standards. The priority list ranks major source categories according to criteria specified in Section 111(f) of the Act. One of these criteria is "the extent to which each pollutant endangers public health or welfare." Volatile organic compounds, with nitrogen oxides, are precursors to the formation of ozone which is well established as having adverse effects on health and welfare.

New source performance standards required by Section 111 play a unique role under the Clean Air Act. The main purpose of NSPS is to require new, modified, and reconstructed sources to reduce emissions to the level achievable by the best technological system of continuous emission reduction. Congress recognized that establishing such standards would reduce potential increases in air pollution from new sources, thereby improving air quality as the industrial base is replaced over the long term. The role of NSPS in achieving the goals set forth in the Act is distinct from that of other regulations.

For the reasons discussed in Comments 2.7.2 and 2.7.3, the Agency has determined that the NSPS will have a favorable impact on VOC emission levels despite a lower growth projection and the possible decrease in VOC use per unit of tape. Because the standard will have a favorable environmental impact and reasonable cost and economic impacts, the proposed standard will not be suspended or rescinded.

2.8.2 Comment

One commenter (IV-D-4) stated that the existing State regulations, at least in the Bay Area of California, are sufficiently stringent and that a new NSPS is not needed.

Response. State requirements serve a different but complementary role to NSPS. State requirements are designed to protect local air quality values and to ensure that air quality does not significantly deteriorate. These requirements may vary according to air quality

conditions in the specific area of the plant whereas NSPS provide a uniform nationwide minimum requirement based on BDT for a particular emission source category, irrespective of local air quality conditions or values. Uniform nationwide standards increase the total emission reduction achieved by an industry by discouraging the preferential construction of plants in States with the least stringent regulations.

The VOC regulations in California are more stringent than the baseline used in the analysis of this industry. However, the regulations in all other States generally require a level of control of 83 percent or lower. The NSPS would set a new floor of 93 percent control for facilities subject to its provisions and, thus, reduce nationwide emissions from this industry. Therefore, the Agency believes there is a need for the standards. Of course, State and local agencies are free to require more stringent control as dictated by the needs of specific locations subject to PSD or new source review regulations.

2.9 REFERENCES FOR CHAPTER 2

1. Telecon. Edgerton, S., MRI, with Hardaway, C., IBM Corp. October 6, 1986. Information on carbon adsorber installation and performance.

2. Telecon. Edgerton, S., MRI, with Miller, K., 3M Company. August 15 and 19, and September 2, 8, and 22, 1986. Information on carbon adsorber installation and performance.

3. Memorandum from Edgerton, S., MRI, to Magnetic Tape Project File. April 2, 1987. Summary of information related to 3M adsorber performance.

4. Telecon. Beall, C., MRI, with Reber, R. and R. Selznick, Baron Blakeslee, Inc. August 26, 1986. Information on carbon adsorber design and performance.

5. Telecon. Beall, C., MRI, with Wuyts, R., Sutcliffe Speakman, Inc. September 3, 1986. Information on carbon adsorber design and performance.

6. Telecon. Edgerton, S., MRI, with Surratt, R., Met-Pro. August 7, 1986. Information on carbon adsorber performance and monitoring.

7. Letter and attachments from Fritz, D., Sony Corp. of America, to Potter, J., EPA/OAR, and Farmer, J., EPA/ESD. April 3, 1987. Supplemental comments on proposed NSPS.

8. Barnett, K. W., P. A. May, and J. A. Elliott (Radian Corp.). Carbon Adsorption for Control of VOC Emissions: Theory and Full Scale System Performance. Final Report. Prepared for U. S. Environmental Protection Agency. Research Triangle Park, North Carolina. DCN No. 88-239-003-20-11. June 6, 1988. 83 p.

9. Memorandum from Barnett, K., Radian Corp., to Carbon Adsorber/ Condensation Project File. February 29, 1988. Minutes of November 12, 1987, meeting with Calgon representatives and followup telephone conversation on December 11, 1987.

10. U. S. Environmental Protection Agency. APTI Course 415: Control of Gaseous Emissions. EPA 450/2-81-005. Research Triangle Park, North Carolina. December 1981. p. 5-13.

11. Reference 8, p. 5-14.

12. Magnetic Tape Manufacturing Industry--Background Information for Proposed Standards. U. S. Environmental Protection Agency. Research Triangle Park, North Carolina. Publication No. EPA-450/3-85-029a. December 1985. Appendix C.

13. Letters and attachments from Smith, C. Law Firm of Arent, Fox, Kinter, Plotkin and Kahn, to Farmer, J., EPA/ESD. September 24 and October 22, 1987. Supplemental response to the Section 114 information request concerning Sony's carbon adsorption system.

14. Calgon Corporation, Activated Carbon Division. Toluene Adsorption on BPL Activated Carbon, 23-7115.

15. Goodstein, S., T. Flachmeyer, and C. Wickersham. Solvent Recovery Combines with Catalytic Incineration to Effectively Control Fumes. Chemical Processes. Mid-November 1985.

16. Memorandum from Berry, J., EPA/CPB, to Wyatt, S., EPA/CPB. June 2, 1986. Minutes of May 7, 1986, meeting between industry and EPA representatives.

17. Telecon. Cassidy, M., MRI, with Memering, L., United Air Specialists. November 11, 1986. Information on condensers.

18. Telecon. Cassidy, M., MRI, with Rieman, D., Arco Industrial Gases. November 11, 1986. Information on condensers.

19. Memorandum from Edgerton, S., MRI, to Magnetic Tape Project File. April 17, 1987. Revised industry growth projection and applicability of the revised NSPS to the projected lines.

20. Memorandum from Edgerton, S. and C. Beall, MRI, to Magnetic Tape Project File. May 11, 1987. Modification/reconstruction control costs--analyses of industry modification scenarios.

21. Memorandum from Friedman, B., MRI, to Magnetic Tape Project File. August 8, 1988. Cost effectiveness of replacement control devices.

22. Memorandum from Edgerton, S., MRI, to Magnetic Tape Project File. March 5, 1987. Determination of solvent utilization cutoff for modified or reconstructed coating operations.

23. Memorandum from Beall, C., MRI, to Magnetic Tape Project File. June 30, 1986. Final solvent storage tank control cost analysis.

24. American Conference of Governmental Industrial Hygienists. Industrial Ventilation--A Manual of Recommended Practice. 19th edition. Edwards Brothers. Ann Arbor, Michigan. 1986. pp. 4-5, 5-37, 5-39, and 5-74 to 5-77.

25. Miller, K., C. Noddings, and R. Nattkenper. Preventing Bed Fires in Carbon Adsorption Systems. For presentation at the 80th Annual Meeting of APCA, New York, New York. June 21-26, 1987. pp. 2-3.

26. Kenson, R. E. Recovery and Reuse of Solvents From VOC Air Emissions. Environmental Progress. Vol. 4, No. 3. August 1985.

27. Memorandum from May, P., Radian Corp., to Crumpler, D., EPA/CPB. January 15, 1988. Report on site visit to Capitol Magnetic Products, Winchester, Virginia.

28. Eastman Chemical Products, Inc. Kodak Solvent Selector Chart. Publication No. M-167E. December 1976.

29. Memorandum from Edgerton, S., MRI, to Magnetic Tape Project File. June 13, 1988. Cost effectiveness of the NSPS at various bed lives.

30. Memorandum from Edgerton, S., MRI, to Magnetic Tape Project File. January 25, 1988. Fixed-bed carbon adsorber bed lives of less than 6 months.

31. Memorandum from Gillette, D., EPA/EAB, to Dowd-Monroe, C., EPA/SDB. November 17, 1986. Comments/revisions of revised BID and Preamble Volume II for the Magnetic Tape.

32. Memorandum from Gillette, D., EPA/EAB, to Dowd-Monroe, C., EPA/SDB. April 27, 1987. The magnetic tape industry "survey."

TECHNICAL REPORT DATA
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1. REPORT NO. EPA-450/3-85-029b	2.	3. RECIPIENT'S ACCESSION NO.
4. TITLE AND SUBTITLE Magnetic Tape Manufacturing Industry--Background Information for Promulgated Standards		5. REPORT DATE July 1988
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Office of Air Quality Planning and Standards U. S. Environmental Protection Agency Research Triangle Park, N.C. 27711		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO. 68-02-3817
12. SPONSORING AGENCY NAME AND ADDRESS DAA for Air Quality Planning and Standards Office of Air and Radiation U. S. Environmental Protection Agency Research Triangle Park, N.C. 27711		13. TYPE OF REPORT AND PERIOD COVERED Final
		14. SPONSORING AGENCY CODE EPA/200/04
15. SUPPLEMENTARY NOTES		

16. ABSTRACT

Standards of performance for the control of VOC emissions from magnetic tape manufacturing lines are being promulgated under authority of Section 111 of the Clean Air Act. These standards apply to all new magnetic tape coating lines using at least 38 cubic meters of solvent per year (m^3/yr) in the production of magnetic tape and to all modified and reconstructed magnetic tape coating lines using at least 370 m^3/yr in the production of magnetic tape. This document contains a summary of the public comments on the proposed standards and EPA's responses, as well as summary economic and environmental impact statements.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution Pollution Control Standards of Performance Volatile Organic Compounds Magnetic Tape Web Coating	Air Pollution Control	13B

18. DISTRIBUTION STATEMENT Unlimited	19. SECURITY CLASS *(This Report)* Unclassified	21. NO. OF PAGES 94
	20. SECURITY CLASS *(This page)* Unclassified	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

United States
Environmental Protection
Agency

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