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Research Triangle Park NC 27711

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Surface Coating of Metal Furniture - Background Information for Promulgated Standards

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Surface Coating of Metal Furniture - Background Information for Promulgated Standards

Emission Standards and Engineering Division

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

October 1982

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ENVIRONMENTAL PROTECTION AGENCY

Background Information
and Final
Environmental Impact Statement
for Surface Coating of Metal Furniture

Prepared by:

10/25/82

(Date)

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1. The promulgated standards of performance will limit emissions of volatile organic compounds from new, modified, and reconstructed facilities for surface coating of metal furniture. 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 which ". . . causes or contributes significantly to air pollution which may reasonably be anticipated to endanger public health or welfare." The promulgated standards of performance are expected to affect all regions of the nation.

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

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1. SUMMARY

On November 28, 1980, the U.S. Environmental Protection Agency (EPA) proposed new source performance standards (NSPS) for metal furniture surface coating facilities under the authority of Section 111 of the Clean Air Act. The proposed standards were published in the Federal Register (45 FR 79390) with a request for public comment. A public hearing was held on January 9, 1981, and four speakers presented comments on the proposed standards. A total of ten commenters representing industry, trade associations, and a State air pollution control agency submitted written comments during the comment period. Their comments and EPA's responses are summarized in this document. The summary of comments and responses serves as the basis for the revisions that have been made to the proposed standards.

1.1 SUMMARY OF CHANGES SINCE PROPOSAL

In response to the public comments and as a result of EPA reevaluation, certain changes have been made in the proposed standards. The most significant change has been a revision in the allowed volatile organic compound (VOC) emission limit. The proposed standards would have limited VOC emissions from affected facilities to 0.70 kilogram per liter of coating solids applied. Several commenters indicated that high solids coatings were not demonstrated at the 68 percent by volume solids content level. Data obtained during the comment period revealed that, although coatings with a solids level capable of complying with the proposed standards and application equipment capable of applying these coatings are available, their use in actual production line situations is not sufficiently demonstrated to be the basis for the standards. Consequently, the emission limit has been revised to 0.90 kilogram of VOC per liter of coating solids applied. This emission limit is based on the use of a

coating with 62 percent by volume solids which is the highest solids content found to be adequately demonstrated and a 60 percent transfer efficiency.

It became evident from the comments received that the designation of affected facility was not clearly understood by all the commenters. Therefore, this section of the promulgated standards has been clarified to define the affected facility as each surface coating operation which includes the coating application station(s), flashoff area, and curing oven.

In order to maintain consistency with other surface coating standards, the definition of "transfer efficiency" has also been slightly reworded. Definitions for the terms "organic coating," "surface coating operation," and "powder coating" have been added to the promulgated standards for clarification. Surface coating operations that apply only powder coatings are exempt from these standards because there are virtually no VOC emissions from powder coatings.

As a result of an internal EPA reevaluation, all reporting requirements have been deleted from this regulation. Monitoring and recordkeeping sufficient to verify the calculation of monthly emissions from each affected facility are required. No reports will be made to EPA, however, except those found in the General Provisions to 40 CFR Part 60 concerning notification and the results of the initial performance test.

Section 60.313, "Performance test and compliance provisions," has been restructured to make it easier to read and understand. The results of the calculations required are identical to those in the proposed standard, but the manner and order in which they are performed have been changed.

In addition, a provision allowing for case-by-case approval of application methods not listed has been added to the standard.

1.2 SUMMARY OF THE IMPACTS OF THE PROMULGATED ACTION

1.2.1 Alternatives to the Promulgated Action

The alternative control techniques are discussed in Chapter 3 of "Surface Coating of Metal Furniture – Background Information for Proposed

Standards," EPA-450/3-80-007a, September 1980. (This document is also referred to as the Background Information Document [BID].) These alternative control techniques are based upon the best demonstrated technology, considering costs and environmental and energy impacts, for metal furniture surface coating facilities. The alternatives of taking no action and of delaying the proposed action are analyzed in Chapter 6 of the BID. These impacts have been reduced by the revision of the emission limits in the promulgated standards.

1.2.2 Environmental Impact of the Promulgated Action

The environmental impacts of the proposed standards are discussed in Chapter 6 of the BID. The projected beneficial air pollution impacts have been reduced somewhat by the revision in the emission limit for the promulgated standards. Emission reduction for the promulgated standards will be greater, however, than that projected for the baseline emissions due to the consideration of transfer efficiency in the NSPS and because the solids content of a complying coating is two percent higher than in the baseline case. Other environmental impacts remain unchanged since proposal.

1.2.3 Economic and Energy Impacts of the Promulgated Action

The economic impact of the promulgated standards depends on the best demonstrated control technology used as the basis for the standards. Since the use of either high solids, waterborne, or powder coatings is still considered to be the best available control technology, the economic impact, as discussed in Chapter 7 of the BID, remains unchanged. The energy impact of the proposed standards is discussed in Chapter 6 of the BID, and remains unchanged for the promulgated standards.

1.2.4 Other Considerations

1.2.4.1 Irreversible and Irretrievable Commitment of Resources. This impact is discussed in Chapter 6 of the BID, and remains unchanged since proposal.

1.2.4.2 Environmental Impact of Delayed Standards. This impact is discussed in Chapter 6 of the BID. The impact will be reduced, however, due to the revision of the emission limit in the promulgated standards.

2. SUMMARY OF PUBLIC COMMENTS

A list of commenters and their affiliations is shown in Table 2-1. Ten comment letters were received containing comments on the proposed standards and the Background Information Document (BID). These comments have been divided into the following categories:

2.1 General

2.2 Emission Control Technology

2.3 Modification and Reconstruction

2.4 Economic Impact

2.5 Environmental Impact

2.6 Energy Impact

2.7 Reporting and Recordkeeping

The comments, issues, and the responses to them are discussed in the following sections. A summary of the changes to the standards is included in Section 1.1 of Chapter 1 of this document.

2.1 GENERAL

2.1.1 Comment: (IV-D-6) A commenter suggested that EPA should encourage operator training on the proper use and maintenance of equipment, possibly by offering additional transfer efficiency credits for firms with operator training programs.

Response: Proper operation and maintenance of facilities is required in Section 60.11(d) of the General Provisions of 40 CFR Part 60. Although EPA does certainly encourage industry to provide adequate training for their spray equipment operators, a program which would give a "credit" for operator training is not within the scope of EPA's regulatory development program. The adequacy of the training program itself would have to be monitored and the implementation and enforcement requirements

are considered to be excessive. Decreases in coating use, part rejection, and maintenance are major economic incentives for a company to implement an operator training program. The Agency believes these reasons are sufficient to encourage proper operation and maintenance of application equipment.

2.1.2 Comment: (IV-F-1; IV-D-5) Two commenters recommended that uniform reporting and recordkeeping requirements be established between all States and EPA. They claimed that nonuniformity creates duplication of records and imposes additional cost upon the manufacturer. The use of one set of terms, formulas, units, methods, and reporting procedures would avoid the burden placed on industry to present data in different formats to the various States and EPA. One commenter suggested that individual States be encouraged to revise existing rules to contain similar emission allowances and compliance dates. This would allow a company operating in more than one State to adopt a uniform compliance plan for all their facilities.

Response: The Agency recognizes the importance of uniformity of terms, formulas, units, methods, and formats among the States and EPA. Through its technical support and guidelines, EPA encourages States to adopt, to the extent possible, consistent units, formulas, methods, terms, and formats. States are also encouraged to obtain delegation authority to enforce EPA standards. This would provide the States the opportunity to eliminate conflicts and duplications. Also, it is easier for States to revise their requirements to conform with a single set of EPA requirements than for EPA to somehow facilitate uniformity at the time it promulgates its own requirements. However, one must recognize that the States and EPA are separate entities which operate under different statutory mandates and internal requirements, and each has the option of selecting the most appropriate means of accomplishing its goals. In the past, EPA has attempted to establish, to the extent practical, uniform terms, formulas, units, formats, and will continue to do so.

2.1.3 Comment: (IV-F-1; IV-F-2; IV-D-2; IV-D-3; IV-D-5) Several commenters requested a change in the definition of the affected facility to include all finishing systems within a manufacturing plant or the

finishing system necessary to provide a finished product. This would allow a plant to average its topcoat emissions with the much lower emissions from an electrocoat system. One commenter requested that the NSPS allow the option of a plantwide emission reduction plan, particularly as it relates to application of the bubble concept for new and/or modified sources at a given plant.

Response: The choice of the affected facility for this standard (each surface coating operation which includes the application station(s), flash-off area, and bake oven) is based on EPA's interpretation of Section 111 of the Clean Air Act and judicial construction of its meaning. In choosing the affected facility, EPA must decide which pieces or groups of equipment are the appropriate units for separate emission standards in the particular industrial context involved. EPA must do this by examining the situation in light of the terms and purpose of Section 111. One major consideration in this examination is that the use of a narrower definition results in bringing replacement equipment under NSPS sooner; if, for example, an entire plant were designated as the affected facility, no part of the plant would be covered by the standard unless the plant as a whole is "modified." If, on the other hand, each piece of equipment is designated as the affected facility, then as each piece is replaced, the replacement piece will be a new source subject to the standard. Since the purpose of Section 111 is to minimize emissions by the application of the best demonstrated control technology (considering cost, other health and environmental effects, and energy requirements) at all new and modified sources, there is a presumption that a narrower designation of the affected facility is proper. This ensures that new emission sources within plants will be brought under the coverage of the standards as they are installed. This presumption can be overcome, however, if the Agency concludes that the relevant statutory factors (technical feasibility, cost, energy, and other environmental impacts) point to a broader definition. Since it is technologically feasible to control each surface coating operation and such control would not be exorbitantly costly (as shown in the economic analysis section of the BID accompanying the proposed standards), selecting this narrowest definition of affected facility is most consistent with the purposes of Section 111.

Two other possible definitions of the affected facility for this standard are: all prime coat (or topcoat) operations in a product line and all prime coat (or topcoat) operations within an assembly plant. The product line definition would have reduced the number of affected facilities and would have permitted tradeoffs between different coatings and application technologies. Likewise, defining all prime coating (or topcoating) operations within a plant as the affected facility would have reduced the number of affected facilities and consequently the associated recordkeeping and compliance calculations. However, such a definition would not necessarily result in either the use of the best technology or the minimizing of emissions from new sources.

For these reasons, the Agency has chosen each surface coating operation as the affected facility.

2.1.4 Comment: (IV-F-1) One commenter stated that the metal furniture industry should not be considered as a "significant source of VOC emissions." He pointed out that EPA listed the industry as a minor source of VOC's according to the impact it would have on public health and also that EPA estimates VOC emissions from the industry at five percent of the nation's VOC emissions.

Response: Standards of performance are promulgated under Section 111 of the Clean Air Act. Section 111(b)(1)(A) requires that the Administrator establish standards of performance for categories of new, modified, or reconstructed stationary sources which in his judgment cause or contribute significantly to air pollution which may reasonably be anticipated to endanger public health or welfare. One important purpose of standards of performance is to prevent new air pollution problems from developing by requiring the application of the best technological system of continuous emission reduction which the Administrator determines to be adequately demonstrated. The 1977 Amendments to the Clean Air Act added the words, "in the Administrator's judgment," and the words, "may reasonably be anticipated," to the statutory test. The legislative history for these changes stresses two points: (1) the Act is preventive, and regulatory action should be taken to prevent harm before it occurs; and (2) the Administrator should consider the role of each single class of

sources in contributing to the cumulative impact of VOC emissions from all sources.

The 1977 Amendments to the Clean Air Act also required that the Administrator promulgate a priority list of source categories for which standards of performance are to be promulgated. A list for new source performance standards was promulgated at 44 FR 49222 (August 21, 1979). Priority ranking was based on consideration of the source's quantity of emissions, the extent to which each pollutant endangers public health and welfare, and the mobility and competitive nature of the source category. The statutory test for listing a category of sources was that it "causes or contributes significantly to air pollution which may reasonably be anticipated to endanger public health or welfare."

As stated in the preamble for the proposed standards, the surface coating of metal furniture is listed as a minor source category on this listing. This classification as a minor source is due primarily to the fact that individual metal furniture surface coating facilities typically emit less than 100 tons of VOC per year. However, the priority list states that "the metal furniture coating industry is also a significant source of VOC emissions, and there are over 300 existing facilities with the potential to emit more than 100 tons per year."

There are approximately 1,400 metal furniture manufacturing establishments in the United States which paint their products. These metal furniture manufacturers are located throughout the country and are generally situated in highly populated urban areas. In fact, 70 percent of the industry is concentrated in nine highly populated States.

The metal furniture industry emits about 95.5 gigagrams (1975 data) of VOC per year. The emissions of VOC result from usage of solvent-based coatings by the industry. These coatings contain organic solvent mixtures of aromatics, saturated and unsaturated aliphatics, alcohols, ketones, esters, and ethers. The emissions of these organic solvents contribute to ozone formation in urban atmospheres. EPA has established a National Ambient Air Quality Standard (NAAQS) for ozone of 0.12 microgram per cubic meter which is currently exceeded in those States where metal furniture manufacturing establishments are concentrated. Information

concerning health and welfare effects associated with ozone can be found in "Air Quality Criteria for Ozone and Other Photochemical Oxidants," EPA-600/8-78-004, April 1978.

The Administrator is called upon in the Clean Air Act to evaluate an industry's contribution to air pollution and make a determination as to the significance of the subject industry's emission contribution. In the case of the metal furniture surface coating industry, the Administrator has determined that VOC emissions from new or modified facilities contribute significantly to air pollution, even though the total amount of emissions like that from many sources which contribute to the inventory of VOC emissions is by itself a small portion of the nation's total VOC emissions, and that this industry would contribute significantly to the nation's total VOC emissions.

In addition, the metal furniture industry is projected to have an annual growth rate of 4 percent through 1985 and will include about 2,000 new, modified, or reconstructed affected facilities by 1985. Based on this growth, the industry will contribute increasing amounts of VOC to urban atmospheres.

Therefore, industrial surface coating of metal furniture was listed as a "significant contributor". This selection was based upon the the number of affected facilities, coating method, the yearly VOC emission rate, the growth rate of the industry, and the location of this industry in or near highly populated urban areas.

2.1.5 Comment: (IV-F-2) One commenter requested that the effective date of the standard be the promulgation date rather than the proposal date.

Response: Section 111(a)(2) of the Clean Air Act states, "The term 'new source' means any stationary source, the construction or modification of which is commenced after the publication of regulations (or, if earlier, proposed regulations) prescribing a standard of performance under this section which will be applicable to such source." Therefore, the statute requires that the applicability date for a new or revised standard be the date of proposal.

2.1.6 Comment: (IV-D-4) One commenter stated that coatings manufacturers and users have a right to demand the same treatment as other citizens who continue to use pounds and gallons instead of metric equivalents.

Response: It is EPA's policy to use metric units, not English units, in regulations and technical documents. This policy is in conformance with Section 3 of Public Law 94-168, the Metric Conversion Act of 1975, which states that the policy of the United States shall be to coordinate and plan the increasing use of the metric system. Therefore, EPA is now in the process of incorporating the International System of Units (SI) into all of its regulations. EPA is currently using as the basic reference a publication entitled "Standard for Metric Practice" (E 380-76) published by the American Society for Testing and Materials (ASTM). This publication explains the SI units and symbols, their application, and rules for conversion and rounding. It may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103. This document is useful in explaining the abbreviations of units of measurement cited in EPA regulations.

2.1.7 Comment: (IV-D-4) One commenter suggested that the specification of weight VOC per dry coating volume could force the exploration of counterproductive technologies and has undermined the initiative to develop powder, aqueous, radiation curable, and high solids coatings.

Response: The commenter provided no data to substantiate his claim that the standard has undermined the initiative to develop low-solvent coatings. The units of the standard are presented in weight VOC per liter of coating solids rather than weight VOC per dry coating volume. The volume of coating solids is obtained from manufacturers formulation and would not necessarily be the volume of the dried coating. Furthermore, these units were selected to encourage the development of low-solvent coatings.

The rationale for the selection of the format of the standard is presented in the preamble to the proposed standard. This format has the advantage of not requiring stack emission tests unless add-on emission control devices are used, dilution air would not present a problem, and

flexibility is allowed in the selection of control systems because it is usable with any of the control methods. The single most important advantage of the format chosen is that transfer efficiency is considered in the emissions determination. Since both solvent content of coatings and efficiency of application are considered, EPA believes the standard will encourage the development of improved coating and application equipment technologies.

2.1.8 Comment: (IV-F-2) One commenter pointed out that the word "volume" appears to have been omitted from one statement in the proposed regulation. On page 79393, Column 1, the phrase "68 percent solids" does not indicate whether the solids content is calculated on a volume or a weight basis.

Response: The commenter is correct in the assumption that the word "volume" was inadvertently omitted. For the purpose of this standard, the solids content of coatings is always considered to be expressed in percent by volume. The word "volume" is used in the appropriate sections of the promulgated regulation.

2.1.9 Comment: (IV-F-2) One commenter stated that comments presented at the National Air Pollution Control Techniques Advisory Committee (NAPCTAC) meeting were not given sufficient consideration.

Response: While all comments presented during the NAPCTAC meeting did not result in changes to the proposed standards, all comments were considered and, where the data supported changes to the BID, changes were incorporated. In addition to numerous minor changes which were made in order to clarify the document, several comments made at the meeting resulted in major revisions. For example, an Appendix E was added to the BID revising the economic impact analysis of powder coatings. Discussion of solid waste generation and spray booth ventilation rates was also added in Appendix E. In addition, the regulation was changed to incorporate additional transfer efficiencies for different coating techniques to offer greater flexibility in achieving the proposed standards.

2.1.10 Comment: (IV-F-2) A commenter expressed concern that customer demands for product performance and color selection may lead to increases

in foreign imports of metal furniture items at the expense of American businesses.

Response: Data presented in the Background Information Document indicate that the impact of foreign imports on the metal furniture industry are almost negligible. The economic analysis for the proposed standard, even at a control level of 0.70 kilogram VOC per liter of applied solids, does not project a trend toward increased imports. Coating manufacturers surveyed claim that the performance and color selection of high solids coatings is comparable to that of conventional solvent coatings and that operating costs may actually be reduced with high solids coatings. Therefore, EPA does not feel that this regulation will have an adverse impact on American businesses.

2.1.11 Comment: (IV-D-1) One commenter, a trade association, stated that due to the questionable nature of the proposed regulation, its failure to recognize the obvious cost impact, and its limited measureable benefits, a significant extension of the comment period should be granted. He requested an extension until May 8, 1981.

Response: In order to allow additional time for industry review of the proposed standards, an extension of the public comment period was granted. The comment period was extended from February 8, 1981 until March 10, 1981. When the commenter was contacted and informed of the extension, he stated that after reviewing the proposal there were no additional comments.

2.1.12 Comment: (IV-D-6) One commenter stated that EPA should have solicited input on the standard from trade associations such as the National Spray Equipment Manufacturers Association (NSEMA).

Response: Several companies which are members of NSEMA have been involved in the development of the standard. Copies of telephone conversation records and of letters to and from equipment manufacturers may be found in Subcategory II of the docket, which contains material used in the development of the proposed standard.

2.2 EMISSION CONTROL TECHNOLOGY

2.2.1 Comment: (IV-F-1; IV-F-2; IV-D-2; IV-D-4; IV-D-5) Two commenters objected to statements in the preamble that 68 percent by volume solids coatings are demonstrated in this industry and are readily available for

use. They contend that such coatings are not currently being applied by hand-held electrostatic spray equipment and are not available for use by the industry. According to one commenter, stricter regulations on the industry are not justified by the state of the art of the control technology, the situation with the economy, and the high cost of borrowing money. Another commenter stated that EPA is forcing technological changes too rapidly upon an industry at a time when efforts should be going into making coatings more cost effective and energy efficient. Another commenter stated that the high viscosity of coatings with greater than 60 percent by volume solids creates problems in accomplishing rapid color changes and that atomization problems limit the types of spray equipment which can be used. According to one commenter, there is not enough technical basis given for setting the standards at the 68 percent volume solids level. He stated that the proposed control level was apparently derived by merely reducing the Control Techniques Guideline (CTG) emission limit by 30 percent. Another commenter stated that he viewed the proposed emission limit as "an arbitrary level of suspect origin."

Response: The proposed standard was based on an analysis of four alternative levels of controls as described in the preamble. Information obtained during the analysis led to the determination that 68 percent by volume solids coatings were being produced by some coating manufacturers and had been successfully applied in production tests. Therefore, the use of a 68 percent by volume solids coating was selected as the basis for the proposed standards. As a result of the comments concerning the availability and applicability of coatings with a 68 percent volume solids content, EPA conducted a survey of several coatings manufacturers and users. The results of this survey (see Docket subcategory IV-E) indicate that although much laboratory work and some production testing has been done with 68 percent volume solids coatings, there are some problems which must be overcome before these coatings can be considered as the best demonstrated technology. The single most difficult problem appears to be the increase in viscosity of the coating as the solids content approaches 68 percent by volume. Increased viscosity requires more energy for manufacturing, and increases agitation requirements

during storing, pumping, and atomization of the coatings. Improper atomization of the coatings by the spray equipment also causes problems with the finish obtained on the metal surface.

Survey results showed that advances are currently being made in the field of higher solids coatings. Several coating manufacturers claim to have coatings, available in a wide range of colors, which can be applied by existing spray equipment and have percent solids contents in the low 60's.[1] Some manufacturers explained that since the States are generally adopting the Control Technique Guidelines (CTG) Document (EPA-450/2-77-032) recommended emission level based on 60 percent by volume solids, all their efforts have gone toward achieving this level. At this volume solids level, the problems with viscosity can be overcome by increased use of in-line heating and slightly larger recirculation pumps.[1]

Most spray equipment manufacturers contacted during the survey indicated that atomization and application of coatings with a percent solids content above 60 has been demonstrated in production tests.[1] Some of the manufacturers recommended the use of in-line heaters in order to maintain a constant material temperature and indicated that these heaters would not be difficult to install. Several of the equipment manufacturers have stated that much of the problem encountered when applying higher solids coatings is directly related to the operator rather than the equipment. According to these contacts, the difficulties in obtaining proper film thickness is a result of solids being delivered to the nozzle at a greater rate than operators are accustomed to. This creates a situation in which the operator, using his normal application pattern, is applying more solids to the target than is necessary, resulting in excessive film thickness. The equipment suppliers indicated that this problem can be overcome by proper operator training and more careful control of material flow rates.

Several representatives of the metal furniture industry were contacted during the survey. Most of those contacted have experimented with higher solids coatings in order to achieve the emission limits required by the State Implementation Plans (SIP's). Results of these trials have been mixed, with some plants experiencing viscosity, atomization, and

excessive film thickness problems when attempting to apply higher solids coatings with existing coating lines. However, through the use of techniques such as in-line heating, larger diameter piping, reduced material flow rates, and improved operator training, many companies have successfully applied coatings which will comply with the SIP's. Due to the rapid increase in the viscosity of coatings as the solids content increases, these corrective techniques are much less efficient and less cost effective at 68 percent by volume solids level than at 62 percent by volume solids. Three plants are currently using coatings with at least 62 percent by volume solids contents.[1] These three plants are considered typical of the industry; two are manufacturers of office furniture and the other manufactures shelving and store fixtures. This represents a wide range of coating uses and specifications since the appearance of office furniture is very critical and the durability of shelving is important. In-line heating is used to aid in viscosity control at one of the plants, and a wide variety of hand-held and automatic spray equipment is used at these plants. A wide range of colors is applied at these plants and the surface on the product is considered acceptable.

The results of the survey clearly showed that 62 percent by volume solids coatings are available and are being applied successfully with hand-held as well as automatic electrostatic application equipment. Some coatings with 68 percent by volume solids are available, but their use is limited to certain products and application with specific equipment which may not be feasible in certain situations. Therefore, EPA is revising the emission limit from 0.7 to 0.9 kilogram of VOC per liter of applied solids. This level is based on the use of a coating with 62 percent by volume solids, a solvent density of 0.88 kilogram per liter, and a transfer efficiency of 60 percent.

2.2.2 Comment: (IV-F-1; IV-D-2) According to one commenter, the basic problem with alternative coating systems such as waterbased, powder, electrodeposition, dip and flow coatings (which EPA interprets to mean those systems which would meet the standard) is the difficulty in obtaining color/texture matching with products painted by conventional sprays.

Another commenter stated that the alternative coating systems are not applicable for a wide range of uses within the industry, thus limiting the choices of control options available to some segments of the industry.

Response: The Agency has identified as the best demonstrated technology the use of either high solids coatings, waterborne coatings, or powder coatings (with appropriate application equipment). The standard is achievable through the use of one of these methods, and as a result, the industry has a choice among several methods capable of meeting the standard. For example, a coater desiring a thick film with high durability might choose powder coating for a product. Two coats of a high solids coating, however, might also accomplish the desired results. Powder or EDP might be chosen if only one or two colors are required. Furthermore, even though EPA's economic analysis has shown that waterbased coatings are likely to be the most expensive option for controlling VOC emissions, some metal furniture manufacturers have chosen to use them. Clearly, in an industry which produces such a wide variety of products as the metal furniture industry, there are always a few situations where, due to product specifications, the number of alternative control methods will be limited. Electrodeposition cannot be used on non-conductive materials, for example, and waterbased coatings require extra precaution against corrosion. Products requiring a metallic finish could not be coated with powder coatings. Nevertheless, there is always at least one coating method that can meet the standards and the color/texture requirements of the industry. The Agency has determined, based on the analysis of the most costly method of control, that when only one method applies, the cost of using that method is reasonable.

2.2.3 Comment: (IV-D-4) One commenter stated certain coatings have been formulated with solvents which are exempt under Rule 66 type regulations and that if all solvents are included in these regulations there would be no substitute coatings of comparable viscosity available.

Response: The Rule 66 regulations exempted solvents based on their rate of reactivity, with the slowest reacting solvents being exempted. More recent tests revealed that the rate of reactivity is unrelated to

the total amount of ozone formed from the reaction of organics in the atmosphere. It merely requires more time for some solvents to react completely. In the December 24, 1980 Federal Register (45 FR 85415), a volatile organic compound is defined as "... any organic compound which participates in atmospheric photochemical reactions; or which is measured by a reference method, an equivalent method, and alternative method, or which is determined by procedures specified under any subpart." EPA has published a list of chemical compounds which are considered to be nonreactive and are, therefore, not covered by the definition of VOC applicable to this standard. This list can be found in the July 8, 1977 Federal Register. An update was published on July 22, 1980. EPA's objective is to reduce the total amount of VOC's emitted; therefore, no solvents that were exempted by Rule 66 will be exempted by this standard except those listed for exemption. Solvents which are normally used in metal furniture coatings are reactive and are subject to control by the standard. However, as discussed previously, EPA has determined that there are coatings available that meet the viscosity requirements of the industry. It should also be noted that the standard does not preclude the use of higher solvent content coatings with add-on control equipment which can be installed at reasonable costs to reduce the VOC emission levels.

2.2.4 Comment: (IV-F-1, IV-F-2, IV-D-2, IV-D-4) One commenter pointed out that most coatings suppliers are currently offering higher volume solids systems that are basically versions of the old lower volume solids systems. The main limitation of this approach is viscosity, i.e., as the volume solids increases, the viscosity increases. The short-term solutions which coating manufacturers are using to solve viscosity problems can cause problems with the quality of the finish on the product. Molecular weight reduction of solvents and coatings also decreases covering.

One of the commenters stated that hand-held electrostatic spray guns are widely used in the metal furniture industry due to the complexity of the metal furniture configuration and the parts mix. There is some touch-up required for hard to reach areas where this type of equipment

is necessary. Because of increases in viscosity over conventional coatings, however, hand-held electrostatic spray guns are limited in their ability to atomize 68 percent by volume solids coatings. Therefore, there would be a problem achieving the desired quality of finish.

Another commenter claimed that due to finish specifications for certain types of metal furniture, (for example, matching the color and texture of products that were produced during different time periods) automatic electrostatic spray equipment must be used. However, he stated that he has not been able to spray coatings with higher than 60 percent volume solids with this equipment due to the viscosity of these coatings.

One commenter stated that equipment is not available which will spray high solids coatings with their increased viscosity and still maintain the proper film thickness and texture without excessive overspray. Another stated that high solids coatings require automatic electrostatic equipment is required to produce a consistent film thickness and that a great deal of manual touch-up is required when the solids content of the coatings is increased.

Response: When the volume solids content of a coating increases the viscosity also increases. It has been confirmed by several coating manufacturers and users that the higher solids coatings which comply with the proposed standard cause significant problems due to their higher viscosity. However, the standard is being revised to a level which can be met by available coatings which are acceptable in terms of viscosity and coverage capacity. The emission limit is now based on the use of a coating with 62 percent volume solids content. Hand-held electrostatic spray guns capable of atomizing and applying 62 percent by volume solids coatings are currently being marketed by several well-known manufacturers of spray equipment.[1] Five of the six spray equipment manufacturers recently contacted stated they have equipment available which can satisfactorily apply 62 percent volume solids coatings. Most manufacturers have indicated that automatic electrostatic spray equipment is the most proven method of applying high solids coatings. Three plants contacted recently indicated that they are successfully applying

coatings with greater than 60 percent by volume solids contents.[1] The film thickness and touch-up requirement problems are solved, according to the equipment manufacturers, by proper training of operators and more exact process controls. Based on this information, it is EPA's judgment that hand-held and automatic electrostatic spray equipment can satisfactorily apply 62 percent volume solids coatings.

2.2.5 Comment: (IV-F-1; IV-F-2) A commenter explained that most of his facilities are now using between 50 and 60 percent volume solids coatings and that he does not expect to reach production use of 60 percent volume solids coatings until the end of 1982. Another commenter concurred stating that the solids levels of coatings for the metal furniture industry are presently at the 53 to 54 percent by volume level. He further stated that quite a bit remains to be done in order to reach the CTG level of 60 percent by volume solids.

Response: The process of converting existing surface coating facilities to use a new type of coating, for the purpose of meeting State emission limits based on RACT, could be a time-consuming change. Each aspect of the line, from initial metal precleaning to final touch-up, must be made compatible with the physical and chemical characteristics of the new coating. Although all the components of a coating line capable of applying 50 to 62 or higher percent by volume solids coatings are available, the process of integrating this equipment into existing lines could require some disruption of the facility. In order to minimize the disruption, most facilities under SIP compliance schedules are phasing into the use of high solids coatings by adapting much of their existing equipment to the new coatings. A facility that is being modified to meet the SIP level can also meet the NSPS level with minor changes and at minimal or no additional costs. Thus, for facilities that for some reason come under the NSPS during conversion to meet SIP requirements, the NSPS will not impose any significant costs beyond those associated with the existing RACT requirements. For example, if the spray booth is enlarged or extra spray guns are added to the booth, then the existing facility might become an affected facility under the modification provisions and integration of control techniques into the

line would be required. Facilities already complying with CTG-based emission limits may become subject to the NSPS through either reconstruction or modification. NSPS compliance for these facilities would not require phase-in construction as required in a facility not yet using CTG coatings. The cost analysis performed during development of the standards indicates that the costs for such a modified or reconstructed facility are reasonable.

2.2.6 Comment: (IV-F-2) One commenter stated that if high solids coatings are used to comply with the standards, increased amounts of cleanup solvents and time would be required for each color change because a complete clean out of the entire paint recirculation line would be necessary. Therefore, the benefit of the standard would be reduced and production time would be lost.

Response: The most common method of overcoming the problem of recirculation line cleanout is the use of separate lines for each major color applied. With this type of system only the spray gun itself must be purged prior to changing to the next color line. This is a very common procedure in most surface coating facilities. An additional step which can be used is portable batch tanks for small jobs or seldom used colors. These batch tanks can be located near the spray booths and eliminate the use of regular recirculation lines for seldom used colors.

2.2.7 Comment: (IV-F-1, IV-F-2) One commenter stated that much of the metal furniture industry is composed of large plants which have long recirculation systems. The increased viscosity of coatings with greater than 60 percent volume solids could create the need for much larger recirculation pumps and larger diameter piping. He also stated that there will be great difficulty in reformulating a number of colors to higher solids because certain pigments have a pronounced effect on viscosity of the coating. Another commenter stated that in-line heaters are needed to reduce the viscosity of the coatings, however, he has found no satisfactory method to install in-line heaters. Problems encountered have been separation of the resins and pigments and the extent of heating involved over the distance in most large recirculation systems.

Response: Data collected during preparation of the Background Information Document indicate that the metal furniture industry is actually composed of mostly small facilities. Fifty percent of the establishments in the industry have less than twenty employees and eighty percent have less than one hundred employees.

There is an increase in viscosity as the solids content of coatings increases. However, equipment is available which can adequately handle 62 percent by volume solids coatings.[1] An increase in the capacity of recirculation pumps and the addition of in-line heating will, with reasonable costs, allow proper recirculation even in very large plants.

Although high solids coatings (62 percent volume solids) are a fairly new technology, several suppliers have a wide variety of colors available. With the vast amount of research going into high solids coatings, most other suppliers of coatings will also be increasing the number of colors available.

Several of the equipment manufacturers contacted during the recent survey provided information on the use of line heating.[1] Most stated that, regardless of the solids content of the coating, line heating was useful in maintaining a consistent coating temperature, thus eliminating frequent spray gun adjustments. With 62 percent volume solids coatings the amount of line heating required for viscosity control is not considered by the equipment manufacturers to be a problem. An article in the July 1981 issue of Products Finishing describes the success which one metal furniture manufacturer has had with coatings in the 53 to 62 percent by volume solids range. The article points out that no paint heaters are employed for these coatings and that the pumps used prior to the conversion to high solids needed no changes.[6] For those instances in which in-line heating is necessary, however, the Agency believes that such heating is a demonstrated method of controlling viscosity at reasonable cost.

2.2.8 Comment: (IV-F-2) A commenter stated that production of high solids coatings with greater than 60 percent solids will be difficult due to the increased demand on agitation equipment, difficulties in filtering, maintaining cleanliness of coatings, increased power input, and transporting problems.

Response: The commenter is correct in stating that viscosity related problems increase as the solids content of coatings increases. However, as noted above and from the recently conducted survey[1] other coating manufacturers indicate that the problems associated with the production of high solids coatings (62 percent volume solids and greater) have been overcome. The incremental costs to the affected facility for the additional equipment are considered by EPA to be reasonable.

2.2.9 Comment: (IV-F-1; IV-D-2) Two comments were received which detailed some of the problems encountered with powder coating systems which are an alternative method of complying with the standards. They claimed that color-critical items cannot be finished with powder coatings because of color matching problems, color repeatability, and poor quality of the finish. Other problems which were mentioned include: lack of an automated color change system, necessity to store powders in an environmentally controlled storage room (which increase energy usage), shorter storage life than solvent-based materials, and the excessive film thickness which must be applied to produce a good surface finish. One of the commenters stated that powder coatings do not lend themselves to wide use in facilities where numerous colors are necessary and frequent color changes occur.

Response: Although powder coating technology differs substantially from conventional solvent based coatings, it is EPA's position that powder coatings are a viable alternative control system for certain segments of the metal furniture industry. Many facilities which produce items such as utility shelving, bed frames, or patio furniture can use powder coatings with excellent results. Information submitted after NAPCTAC by manufacturers of powder coatings indicated that most of the problems identified by the two commenters have been overcome by recent technological advances.[3] Separation by color of collected overspray for recycling purposes is one problem which still exists. For this reason, powder coatings are best suited for processes where few color changes are required. There are, however, numerous facilities where only a few colors are used, and powder coatings would be a reasonable alternative control measure. In any event, as shown in the proposal preamble and

earlier responses, in those cases in which powder coating is not adequately demonstrated, at least one of the other application methods described by EPA would achieve the revised limit at reasonable costs.

2.2.10 Comment: (IV-F-1; IV-D-2; IV-D-4) Several commenters discussed concerns with the use of waterbased coatings as an alternative to solvent-based coatings. One stated that waterbased coatings are only available in a limited number of colors and that there are problems with quality, texture, and sheen of the product. He also claimed that equipment and operating costs and energy usage are all increased with waterbased coatings. Another commenter stated that these coatings require long flash-off areas and humidity controls due to the slower evaporation rate of the water. He also mentioned intercoat adhesion problems when applying a waterbased topcoat over an electrocoat prime. One commenter suggested that corrosion problems, leading to rather short equipment life, are common due to the water content of these coatings.

Response: EPA's analysis of the various control technologies which could be used to control VOC emissions revealed several characteristics of waterbased coatings which might limit their use in this industry. Waterbased coatings are reported by some facilities, however, to be available in a wide variety of colors and to produce an acceptable finish. Intercoat adhesion problems can be overcome by the addition of an intermediate, or "guidecoat," layer of coating applied after the electrocoat primer. There are more costs associated with waterbased coatings, however, because of the requirements for humidity controls, increased coating line length, more careful surface pretreatment, and stainless steel piping. In situations where waterbased coatings are not acceptable, however, at least one of the other application methods would achieve the revised emission limit at reasonable costs.

2.2.11 Comment: (IV-D-4) One commenter stated that although waterbased coatings appear to be viable candidates for metal furniture, they have too high a resin/solvent mixture conductivity to be used with electrostatic spray. He also stated that the high-energy aqueous systems which could meet the regulation will emit formaldehyde under complete cure conditions. Low-energy systems which do not emit formaldehyde also do not meet the proposed emission limit.

Response: Waterbased coatings can be applied by electrostatic spray if the proper safety precautions are taken. However, most waterbased coatings are capable of meeting the revised emission limit even when applied by non-electrostatic spray methods. The formation of formaldehyde from waterbased coatings is due to the amine concentrations found in certain formulations. Formaldehyde emissions can be minimized by avoiding unnecessarily high amine concentrations. Waterbased coatings were selected as the best demonstrated technology for the Automobile and Light-Duty Truck Surface Coating NSPS, and formaldehyde formation was not found to be a significant problem. The paint specifications for metal furniture coatings are not expected to be more stringent than for automobile coatings.

2.2.12 Comment: (IV-D-4) One commenter stated that the coverage capacity of high solids coatings can be improved by increasing the hydroxyl content of certain resins, for example, but the resulting paint is extremely sensitive to curing conditions. Some of this sensitivity can be relieved through other chemical modifications to the resins, but the product is never as convenient to use.

Response: Increasing the hydroxyl content of coatings causes the coatings to be more dense and, therefore, represents one method of improving their coverage capacity. EPA recognizes, however, that if too many hydroxyl groups are added on the resin chain, the coating can become more brittle and more sensitive to cure conditions.

As a general matter, improper formulation of the resins would have serious effects on the quality of the finish regardless of the solids content of the coating. Also, since hydroxyl groups are normally used only in polyester- and alkyd-type coatings, the curing sensitivity factor the commenter mentions would not be common to all higher solids coatings. The EPA does not expect curing sensitivity to be an insurmountable problem where hydroxyl content can be increased to improve coverage. The coverage obtained in a coating operation is not just a function of coating chemistry. It is also dependent on the application equipment and the operator of the equipment (in a non-automatic booth). No metal furniture manufacturer has indicated that proper coverage

cannot be achieved because increased hydroxyl content results in unacceptable curing sensitivity. This indicates that several coating manufactuers have developed coating chemistries that, in combination with their application methods, provide the necessary coverage without increasing hydroxyl content so much that extreme curing sensitivity cannot reasonably be avoided. In those few instances in which satisfactory low-solvent coatings cannot be developed, a coater could install add-on control equipment at reasonable costs to meet the standard.

2.2.13 Comment: (IV-D-4) One commenter stated that electrostatic application techniques and paint preheating can be used to enable a coater to spray a complying coating. However, there is a danger of explosion if the equipment handling the paint is operating at up to 0.1 megavolts and the application temperature is far in excess of the flash point of the coating.

Response: The possibility of an explosion in a spray booth exists only when the lower explosive limit (LEL) of the solvents in the booth is exceeded. Current Occupational Safety and Health Administration (OSHA) regulations specify that sufficient dilution air be provided in the booths to maintain a maximum solvent concentration well below the LEL. The same or even more potential for explosions exists when conventional coatings are used since they contain more solvent and are often heated to insure constant viscosity. Furthermore, electrostatic spray is a well proven technology in common use and the potential for explosion is significantly reduced by properly insulating the equipment and providing adequate ventilation. Therefore, EPA believes coatings and application equipment which will enable compliance with the standard do not pose any additional hazards compared to conventional coatings and equipment.

2.2.14 Comment: (IV-D-4) According to one commenter several coatings which might meet the emission limit are not suitable for use on metal furniture because the conductivity of the solvent/resin blends makes them incompatible with electrostatic spraying. Some of these coatings are also subject to "yellowing."

Response: The commenter only mentioned conductivity as a reason why some coatings cannot be applied with electrostatic equipment at high

efficiency but provided no specific support for this claim. There are two primary reasons why this concern appears unfounded. First, waterbased coatings have a very high conductivity, yet they can be applied electrostatically in a properly designed system. Second, even if in some cases conductivity reduces transfer efficiencies substantially, the coater's ability to comply with these standards would not be affected. This is because the method of compliance determination allows the operator to use a value from the transfer efficiency table based on the type of equipment used even through his actual efficiency may vary somewhat with different coating formulations.

The problem which the commenter pointed out concerning the "yellowing" of some coatings may be true in certain cases. Other manufacturers, however, report that the durability of high solids coatings meets or exceeds that of conventional solvent coatings. With the endless number of possible coating formulations there are certain to be many which do not perform as well as desired. In EPA's judgment, complying coatings with acceptable properties are available.

2.2.15 Comment: (IV-D-4) One commenter warned that the formation of reaction byproducts during cure operations can actually increase VOC emissions by as much as 60 percent over current approaches to lowering emissions.

Response: The VOC emissions released during the cure operations, also referred to as "cure volatiles", are dependent on the resin formulation of the coatings and can vary over a wide range. Although there is no standard test method to quantify actual cure volatile emission rates under all oven conditions, they are generally considered to be in the range of 5 to 10 percent of total VOC emissions. Therefore, it is EPA's policy to concentrate its emission reduction efforts on those VOC which are contained in the coating prior to the reactions caused by the elevated temperatures in the bake ovens.

2.2.16 Comment: (IV-D-4) One commenter stated that if current high solids coatings are able to achieve the emission limit when the paint is warmed, but are unable to achieve it under wintertime conditions, then other technologies must be considered.

Response: The problems of wintertime storage of coating is not unique to high solids coatings. Conventional solvent coatings require agitation in bulk storage tanks and warming prior to application just as high solids coatings would. With an increase in solids content, slightly more agitation may be required, but the technology is the same.[4] In addition, conventional solvent coatings are normally purchased and stored at a solids content level similar to that of a complying coating. The dilution solvents are then added in the paint mix room. Therefore, the problems of wintertime storage and use are not expected to be significantly greater for high solids coatings than for conventional coatings.

2.2.17 Comment: (IV-D-4) One commenter stated that other types of coating systems (such as urethane, powder, and radiation cure coatings) have some limited potential for use but are not sufficiently developed to be used as an alternative for compliance with the standard.

Response: During development of the Background Information Document, all of the major coating technologies except radiation cured coatings were found to be in use to some degree in the metal furniture industry. Urethane coatings were not considered as an alternative method of compliance simply because the VOC emissions from these coatings are too high. Two component type urethane coatings which can meet the standards have serious OSHA problems, but nonetheless, could be used to comply if the problems are overcome. Powder coatings, waterbased coatings, and high solids coatings were considered as control alternatives because VOC emissions can be significantly reduced by changing from conventional solvent based coatings to any of these systems. Designating these coating systems as control alternatives does not mean that they are applicable in all situations, but rather that they can comply with the emission limits in situations where their properties allow their use.

2.2.18 Comment: (IV-F-1; IV-D-5; IV-D-6) Several commenters made statements concerning the use of the table of assigned transfer efficiencies in the regulation. One commenter suggested that a production line testing program be used to determine the proper efficiencies and that EPA clarify whether the table values were intended for equipment

manufacturers or users. Another commenter stated that the assigned values seemed unrealistic to be used as universal standards. He also stated that if transfer efficiencies are to be assigned, however, then all known application methods should be included in order to avoid the time consuming process of obtaining approval to use alternative equipment. In his comment he noted that the continuous coater method and the liquid seal process were not mentioned. One commenter presented a very detailed alternative to the use of the existing table of transfer efficiencies. He stated that the generic classifications of equipment now in the regulation is very poorly defined and explained that actual transfer efficiency is dependent on many factors such as equipment configuration, operating conditions, the part being coated, the coating being applied, and the operator. He recommended that the variables in design and operation of equipment be considered by defining such parameters as voltage, atomizing pressure, flow rates, etc., of each type of spray equipment. He also suggested that a standardized test method be adopted to determine transfer efficiency of equipment. Equipment could then be "certified" by the manufacturers and a list of equipment ratings and operating conditions could be supplied to EPA for publication.

Response: EPA believes that to reflect the best demonstrated technology for the metal furniture coating industry, emission limits for new sources must incorporate the use of both high solids coatings and relatively efficient application equipment, but must not at the same time deny industry flexibility to use different types of application equipment and different coatings. For this reason, the Agency has included the key transfer efficiency concept in these standards.

The commenters' claim that all the listed parameters affect transfer efficiency is correct. However, a universally acceptable test method for determining precise transfer efficiency under each conceivable set of variables has not yet been developed. This means that the Agency must either delete this crucial component of BDT or instead include in the standards assigned transfer efficiency values that correlate at least generally to the efficiencies of the application equipment used in the industry. EPA has chosen the latter course. The Agency has included

values that are correlated to each piece of equipment and are sufficiently high to ensure that, regardless of coating properties and other relevant variables, each facility will be credited with at least the efficiency its equipment attains with the particular coatings it applies. These transfer efficiencies listed are based on data provided by spray equipment manufacturers and results of tests conducted during standard development. EPA contacted and visited several equipment and coatings manufacturers during the standard development process.

Moreover, the standards provide that if the operator can demonstrate to the satisfaction of the Administrator that other transfer efficiencies are appropriate (e.g., due to variables such as those cited in the comment), the Administrator will approve their use on a case-by-case basis. This provision ensures that a facility using equipment that achieves an efficiency greater than that assigned by the standard is fully credited for the efficiency achieved.

The preponderance of metal furniture coating application techniques are addressed in the table. In addition, the regulation contains provisions whereby alternative coating equipment may be approved. Transfer efficiency values for coating methods which are not specifically addressed in the table can be determined in a manner similar to the way the table was developed. Data can be obtained from the manufacturer of the equipment, testing procedures can be submitted, and based on an analysis of the data, EPA will determine the efficiency to be used in the emission calculations. The Agency does not believe this process of obtaining the Administrator's approval to use alternative equipment would be unreasonably time consuming. Also, this approval need only be obtained once for any one application technique. The application methods and values in the transfer efficiency table will be reviewed in the future and if appropriate, the table will be revised.

2.2.19 Comment: (IV-D-6) One commenter suggested that key operating parameters of spray equipment be monitored on a regular basis (monthly) to be sure they are within design specifications. He recommended this be done at the same time that monthly determinations of VOC emission compliance occurs.

Response: While EPA considers that the proper operation and maintenance of a coating process should be routine procedure, the significance of variations in operating parameters are understood to be great. Subpart A of the General Provisions of 40 CFR Part 60, Section 60.11(d) states that: "At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source." EPA believes that this general requirement, coupled with economic incentives such as reduced coating use, are sufficient to ensure that coatings users check key operating parameters and maintain application equipment in good condition.

2.2.20 Comment: (IV-D-6) One commenter stated that the generic listing of application equipment in the transfer efficiency table will tend to encourage the use of lower priced, inferior equipment that does not perform as well as indicated in the table, while discouraging the use of equipment that is capable of exceeding the table values.

Response: The EPA recognizes that in some cases a coater may receive credit under the transfer efficiency table for efficiencies his equipment does not fully achieve. The Agency does not believe, however, that this small discrepancy will provide incentive for coaters to choose such less efficient application equipment when highly efficient equipment benefitting both the facility and the environment is available. For example, electrostatic equipment was developed for its improved efficiency, and that will still be its major selling point.

The Agency has confidence in the ability of manufacturers to assess the various types of application equipment and to decide which types of equipment will best meet their particular needs. The transfer efficiency table will generally assure that relatively poor application equipment

cannot be used without a corresponding increase in the solids content of the coatings applied. In this respect, it offers some incentive for coaters to choose efficient application equipment where they seek to use lower solids content coatings.

2.2.21 Comment: (IV-D-6) One commenter stated that the necessity of a case-by-case request for alternate transfer efficiencies poses an additional burden for suppliers of high performance equipment.

Response: A request to the Administrator for alternate transfer efficiencies is submitted by the metal furniture manufacturer not the equipment manufacturer. EPA recognizes that this process is somewhat of a burden and, therefore, the standard is written in a manner which is intended to minimize the need for case-by-case transfer efficiency determinations. Only in the situation where a facility believes their efficiency is greater than the applicable transfer efficiency table value would this determination be required. Even in the absence of this standard a manufacturer who claims to have superior equipment must demonstrate his claims to prospective customers.

2.2.22 Comment: (IV-D-7) The table of transfer efficiencies listed in the proposed standards lists 25 percent transfer efficiency for both airless spray and air atomized spray. One commenter stated that the transfer efficiency for airless spray systems is superior to that of air spray systems. Also, he claimed that manual airless electrostatic spray would have a superior transfer efficiency to manual air electrostatic spray.

Response: The transfer efficiency of air atomized and airless spray equipment is very dependent on the product being coated. Airless spray equipment performs better when the product being coated has large flat surfaces or enclosed areas such as the interior of desk drawers. When the target is complex, such as the spokes on a wheel, there is virtually no difference in efficiency between the two methods. The difference in efficiency is due primarily to the fact that coating solids become entrained in the air stream from an air atomized sprayer. When being directed against a flat plate or into a confined area, the air movement becomes very turbulent and sometimes carries coating solids

away from the target. With airless spray, however, only solids are being sprayed and the turbulence is reduced and entrainment of solids is eliminated.

The transfer efficiency table is intended to represent an overall average value and, as such, is believed to be as accurate as possible. If a situation exists where a facility uses airless spray and feels the table value is too low, then the owner or operator can provide appropriate data to support a request for approval from the Administrator to use an alternate value for transfer efficiency.

2.2.23 Comment: (IV-D-4) The proposed standards seem practicable according to one commenter, when considering a light color applied by dipcoat to utility shelving at a high film build. However, this coating would emit a high quantity of VOC yet be within the VOC emission limit. A higher quality coating at a lower volume solids applied by spraying could actually emit less VOC to the atmosphere.

Response: Through variations in the combination of coating formulation and transfer efficiency, situations such as the commenter described could be possible. However, the standard is based on what are considered to be more typical situations. It is not EPA's intention to dictate the film thicknesses to be used within the industry. The units of the standard are designed to control the rate of emissions per volume of coating solids applied regardless of the film thickness desired. Industry-wide VOC emissions will be reduced by the standard when compared to the emissions from the use of conventional solvent-based coatings.

2.2.24 Comment: (IV-D-9) One commenter submitted information concerning the potential for cost effectiveness and performance of regenerative thermal oxidation systems. A system designed by the commenter is claimed to be capable of providing primary heat exchange efficiencies of 85 percent, 90 percent, and 95 percent in the thermal oxidation process. The high thermal energy recovery of this system allows operation in a self-sustaining mode on hydrocarbon contents of from 3 percent to 5 percent of the Lower Explosive Limit (LEL). Little or no additional fuel is required. This system virtually eliminates the following problem areas generally associated with incineration systems: (1) fouling of heat transfer surfaces, (2) corrosion, (3) catalyst poisoning, (4) secondary emissions, and (5) high

operating costs with low LEL gas streams. The commenter requested clarification of the potential of regenerative thermal oxidation systems in the documentation for the promulgated standard.

Response: The analysis of incineration found in Chapter 3 of the BID reveals that this option has a significantly greater capital investment and an increase in energy consumption, over other control options. Although the annual operating costs and energy use of a regenerative thermal oxidation system may be lower, the initial capital investment is large compared to that for low solvent coatings technology. The reduction in total organic solvent emissions realized by controlling the topcoat oven is small because only 20 to 30 percent of these emissions are concentrated in the oven. The remaining 70 to 80 percent of the emissions are from fugitives from the application and flashoff areas. The small percentage of emissions available for reduction by incineration makes any incinerator difficult to cost justify when compared to low solvent coatings. Therefore, the Administrator does not believe that further clarification of the potential of regenerative thermal oxidation systems is necessary.

2.3 MODIFICATION AND RECONSTRUCTION

2.3.1 Comment: (IV-F-1; IV-F-2; IV-D-5) Several commenters expressed concern that expenditures made to comply with a State Implementation Plan (SIP) could bring the facility under the NSPS as a reconstruction. They requested that this situation be avoided by exempting SIP-related expenditures from the reconstruction provisions included under the General Provisions of 40 CFR Part 60.

Response: This was a valid issue at the time the standard was proposed with an emission limit that was considerably more restrictive than most State regulations. Since proposal, however, the recommended standard has been revised so that it is now based on the use of a coating only two percent higher in volume solids content than the coating recommended in the CTG document. Because the technologies required to comply with the two emission limits are similar and no additional equipment would be required to apply an NSPS complying coating versus a CTG complying coating, the commenters' situation is no longer considered to be an issue.

2.4 ECONOMIC IMPACT

2.4.1 Comment: (IV-F-1) One commenter stated that continued development of inflexible standards will impact the growth of the industry and result in loss of job opportunities. The commenter continued by saying that the cost to comply with the proposed standards will be much higher than projected. These increased costs are due to higher construction, operating, and energy costs. A comparison of cost and energy requirements for a plant built in 1977 versus a plant built in 1980 was submitted by the commenter.

Response: It is definitely true that costs of construction, raw materials, labor, and energy have increased significantly since the economic analysis portion of the BID was completed. Many of these costs, however, will not be any greater for a complying high solids coating system than for a conventional solvent coating system. If line heating, larger diameter recirculation lines, or more powerful agitation equipment is specified, there would be an increase in costs. However, these costs are considered to be reasonable. A recent SME technical paper (FC81-237) reported that both operating and energy costs can actually be reduced by using high solids coatings rather than conventional solvent based coatings.[2] The BID also indicates that a potential for savings in annualized costs exists with the use of higher solids coatings. This savings results from a decrease in the energy required to dry the coatings and lower labor and maintenance costs. Materials costs are also reduced because with higher solids coatings, even though the price per gallon may be higher, fewer gallons of coating are needed.

2.4.2 Comment: (IV-F-2; IV-D-2) One commenter stated that the types of application equipment necessary to apply high solids coatings in order to meet the standards is exceedingly costly to the industry. Another commenter claimed that the electrostatic equipment is much more expensive than conventional spray equipment now being used.

Response: The economic impacts discussed in the BID are based on the use of electrostatic equipment to apply higher solids coatings. Although electrostatic spray equipment is more expensive than conventional equipment, EPA believes its advantages outweigh the costs. The projected

payback time for an average size plant purchasing electrostatic equipment in lieu of conventional equipment is less than one year.[5] Most of the newer plants contacted during development of the standard were using electrostatic equipment (automatic and hand-held) because of the improved efficiency. Since the standard applies only to new sources and sources undergoing modification or reconstruction, it is anticipated that many affected facilities would use electrostatic equipment even in the absence of the standard.

2.4.3 Comment: (IV-D-5) A commenter stated that the additional requirements of the NSPS (over the SIP requirements) will cause an unreasonable financial burden on the industry.

Response: At the revised emission level of 0.90 kilogram VOC per liter of applied coatings solids, the NSPS will have minimal additional requirements over what most SIP's require. The SIP's are generally based on the recommended guidelines in the EPA Control Techniques Guideline (CTG) document. Although the CTG document uses different units, the control level is essentially the same as the revised NSPS level. Therefore, EPA does not believe the promulgated standards will have an unreasonable financial impact on the industry.

2.4.4 Comment: (IV-D-8) One commenter expressed concern over the validity of the cost analyses in the Background Information Document and requested that EPA solicit information from the industry through the National Spray Equipment Manufacturers Association (NSEMA).

Response: EPA did solicit information from both industry and the various associations related to the industry. Most of the data used in preparing the supporting document for the standard were obtained from industry related sources. Several members of the NSEMA were contacted for information during development of the standard. The Agency is unaware of specific types of information known only to the industry that should be reflected in the cost analysis.

2.4.5 Comment: (IV-F-2) One commenter stated that the use of coatings with greater than 60 percent volume solids required larger recirculation pumps and larger diameter piping which increases the costs of new systems. This increase in costs was considered by the commenter to be unreasonable.

Response: A coating system designed to apply a coating with 62 percent by volume solids is not expected to be significantly more costly than a system designed to apply conventional solvent-based coatings. The incremental costs of additional equipment required to overcome viscosity increases is judged to be reasonable. In addition, an overall savings is expected in operating costs due to a reduction in coating usage and energy required for drying the coating.

2.4.6 Comment: (IV-F-1) One commenter stated that equipment and operating costs would increase with the use of waterbased coatings.

Response: The economic analysis performed on the use of waterbased coatings as a control technology indicated that costs were greater for waterbased coatings than for the high solids system. As discussed in other responses, alternatives other than waterbased coatings are available for use in meeting the standard.

2.5 ENVIRONMENTAL IMPACT

2.5.1 Comment: (IV-D-4) One commenter warned that the requirements of the standard will create a "numbers game" which will be played by the coatings manufacturers and users and may cause an increase in VOC emissions while satisfying the letter of the law.

Response: Situations such as described in this comment are, no doubt, possible in cases where the environmental concern of the companies involved is limited to merely not violating EPA regulations. In contrast, a tremendous amount of effort has already been expended by many companies in the industry who are concerned with complying with the intent as well as the letter of the law. Although there have been technical problems encountered, coating technology is available to meet the standard which will result in a reduction of VOC emissions to the atmosphere.

2.6 ENERGY IMPACT

2.6.1 Comment: (IV-F-1) One commenter stated that energy usage is significantly increased with waterbased coatings due to the fact that water is more difficult to evaporate out of the coating than a conventional solvent.

Response: The use of waterbased coatings is one of several alternatives that may be used to meet the standards. Even though the

cost analysis in the BID shows the method to be expensive, and the energy impact analysis shows the bake oven energy requirements to be greater than for conventional solvent-based coatings, some companies have chosen to use waterbased coatings to meet certain performance specifications. There are other areas of the coating line, however, that may actually use less energy with waterbased coatings. An example of this is the application area where, because of the decrease in solvent content, less dilution air movement is required to maintain safe conditions.

2.6.2 Comment: (IV-D-2) A comment was received which stated that installation of incinerators on all spray booth stacks and oven vents to obtain compliance with the standards would be an expensive waste of energy due to the fuel which would be required to sustain combustion of the exhausted solvents.

Response: Even though incineration is expected to have limited use in this industry as a means of controlling emissions, EPA did perform an analysis of the impacts of this alternative. The analysis of incineration as a means of emissions control indicated a substantial impact on energy consumption relative to other control technologies. This was the primary reason that incineration was not considered to be the best demonstrated control technology even though it is a control technology available at reasonable cost. EPA recognizes, however, that incineration of oven vents used in conjunction with coatings having a volume solids content less than 62 percent could be an alternative to using a 62 percent by volume solids coating system. Manufacturers using such systems with incineration would have more flexibility in their selection of coatings and coating manufacturers and, by returning the available heat from the incinerator back to the process, would not experience a drastic increase in energy costs.

2.7 REPORTING AND RECORDKEEPING

2.7.1 Comment: (IV-F-1; IV-D-4; IV-D-5) Several commenters stated that they viewed the reporting and recordkeeping requirements as an unnecessary and expensive burden on both the coating manufacturers and coating users. One commenter stated that monthly recordkeeping to

determine compliance would be difficult due to the fact that paint is usually purchased in large volumes and delivered over a long period of time. Another commenter, a coatings supplier, presented a detailed plan for recordkeeping and reporting which is based on data contained in OSHA's Material Safety Data Sheet (MSDS). The major points of his proposal are as follows:

a. All coatings suppliers submit to users information on their coatings. Every coating, catalyst, reducer, and modifier shipped to the user is described in detail with an MSDS for each coating formulation.

b. Coatings suppliers keep records of all shipments made to each customer, usually by quarterly and annual basis, and many suppliers computerize this information.

c. The recordkeeping counterproposal is to switch from a monthly compliance determination to an annual event, or an "inventory day," somewhere near the end of the year.

d. By using the shipment records and subtracting inventory on hand, a total picture of VOC emissions is determined.

e. High technology industrial coatings are expensive and users will know to the nearest drum or gallon how much was purchased and how much is on hand, perhaps not on a monthly basis but on a quarterly or annual basis.

f. The reporting requirements can be implemented by the following steps:

   (1) The coatings and solvent suppliers shall submit a form 20 OSHA approved MSDS with each composition sold to the user.

   (2) The individual signing the MSDS for the coating or solvent supplier shall be responsible to the user for the accuracy of the information.

   (3) The coatings and solvent suppliers can be asked to supply shipment information upon request of the user on an annual basis for purposes of determining compliance with the regulations.

(4) The user is responsible for the accuracy of the annual usage report of VOC-containing materials.

(5) The EPA may audit the data, but may request no records other than those already required by the IRS, DOT, OSHA, DOE, and the EPA itself under the Major Generator Provisions of the Resource Conservation and Recovery Act (RCRA).

Response: As a result of this comment and others, EPA has been investigating alternative ways of reducing monitoring, recordkeeping, and reporting burdens on owners and operators. The goal is to reduce all recordkeeping and reporting that is not essential to determining compliance or to ensuring proper operation and maintenance. After reviewing the requirements in the proposed standards, EPA determined that monthly compliance tests, monitoring and the compilation of monitoring data are essential for both the owner or operator and EPA to determine compliance and to ensure proper operation and maintenance. A responsible owner or operator would need monitoring information compiled in a usable form to determine when adjustments in the control system are needed to ensure that it is performing at its intended effectiveness level.

The proposed standard was written with the understanding that much of the data required to complete a compliance determination would be provided to the facility by their coating manufacturers. Some additional information, such as transfer efficiency and dilution solvent added at the plant, would be provided by the facility itself. It would appear that a facility manager would keep records of this type, even in the absence of any requirement to do so, to assure efficient materials utilization. EPA is therefore requiring only the additional step of filing the information in an accessible location. Because EPA judges that monthly compliance tests, monitoring and recordkeeping are essential for determining compliance and proper operation and maintenance, these requirements have not been changed since proposal. It was judged, however, that reporting is not essential to EPA. In addition, when States are delegated the authority to enforce these standards, they may

prefer either not to have reporting or to have reporting on a different schedule than EPA proposed. Therefore, the requirement to report violations of the standard and quarterly incineration reports have been removed since proposal. A State, however, at any time is free to impose its own reporting requirements in conjunction with this regulation.

The data supplied by the coating manufacturers may be in any format which is agreeable to the plant owner or operator. Likewise, the owner or operator may use any format in maintaining records as long as all the pertinent data is clearly identified, complete, and in the appropriate terms and units. As required in the regulation, a facility must maintain the records for a period of two years. Reports prepared for other agencies may be used for EPA requirements if the preceding conditions are met. Since this standard applies to the metal furniture industry, the coatings users and not suppliers are responsible to EPA for the completeness and accuracy of all reports and records.

2.7.2 Comment: (IV-D-4) One commenter recommended an alternative equation for calculating emissions. He stated that the alternative equation simplified the reporting tasks for the coating supplier as he need only report the pounds per gallon of coating, the percent total nonvolatile of the coating, the percent VOC (if not totally solvent based), and the percent volume nonvolatile. All of these are normally covered on the form 20 OSHA approved MSDS used by coating suppliers.

Response: The commenter is correct in that the four coating parameters he would prefer using can be easily converted to the values required in the standard to determine emissions. Thus, it is acceptable for a coating supplier to report these four alternative parameters.

However, the commenter's proposed alternative equation for calculating emissions is not equivalent to the procedures in the standard, and could only be used in specialized cases. The commenter's simplified operation merely calculates the VOC content (in kilogram VOC per liter of solids) for each individual coating. This approach is acceptable only if every coating used at an affected facility had a VOC content (adjusted by the applicable transfer efficiency) below the standard of 0.90 kilogram VOC per liter solids applied.

The EPA procedure for determining emissions allows for the use of coatings with higher VOC content if they are balanced with low VOC content coatings. This is possible because the basis of the standard is a monthly volume-weighted average VOC content for all coatings, not the VOC content of each individual coating. To calculate this volume-weighted average, one must know the amount of each coating used that month.

The EPA's approach makes the equations more complicated, and requires more recordkeeping, but, on the other hand, allows the industry to use a wider variety of coatings. If only complying, low-solvent content coatings are used at a particular facility, the commenter's simplified equation is accepted.

Table 2-1. LIST OF COMMENTERS ON THE PROPOSED STANDARDS OF PERFORMANCE FOR SURFACE COATING OF METAL FURNITURE

Docket entry number[a]	Commenter/affiliation
IV-D-1	H. O. Buzzell Health Industry Mfgrs. Association 1030 15th St. N.W. Washington, D.C. 20005
IV-D-2	R. Laird Shaw/Walker Muskegon, Michigan 49443
IV-D-3	H. H. Hovey N.Y. Dept. of Envr. Conservation 50 Wolf Road Albany, New York 12233
IV-D-4	G. S. Jones Inmont Corporation P. O. Drawer 1297 Morganton, N.C. 28655
IV-D-5	M. I. Harden Lyon Metal Products Inc. Aurora, Illinois 60507
IV-D-6, IV-D-14	S. J. Gunsel Nordson Corporation Amherst, Ohio 44001
IV-D-7	M. T. Melester Foy Johnston, Inc. 1776 Mentor Avenue Cincinnati, Ohio 45212
IV-D-8	K. N. Larson Graco, Inc. P. O. Box 1441 Minneapolis, Minn. 55440
IV-D-9	R. L. Pennington Reeco, Inc. Box 600 520 Speedwell Avenue Morris Plains, N. J. 07950

(continued)

Table 2-1. Continued

Docket entry number[a]	Commenter/affiliation
IV-F-1	Transcript of Public Hearing, Speakers were: Steven J. Gunsel Nordson Corporation David O. Lawson PPG Industries David L. Dornbos, Sr. Steelcase, Inc. Lou LeBras PPG Industries
IV-F-2	D. O. Lawson PPG Industries, Inc. P. O. Box 127 Springdale, PA 15144
IV-F-3	D. L. Dornbos, Sr. Steelcase, Inc. Grand Rapids, Michigan 49501

[a]These designations represent docket entry numbers for Docket No. A-79-47. These documents are available for public inspection at: U.S. Environmental Protection Agency, Central Docket Section, West Tower Lobby, Gallery 1, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460.

2.8 REFERENCES

1. Letter from Charles Hester, TRW, to Shirley Tabler, U.S. Environmental Protection Agency, dated January 28, 1981. Summary of results of telephone survey. (docket entry IV-B-8)

2. Fishkin, H.W. Finishing Systems Economic Overview - A Report of an Industry Study. SME Technical Paper No. FC81-237. March 1981. (docket entry IV-J-1)

3. Letter from T.J. Scattoloni, Armstrong Products Co., Warsaw, Indiana, to Don R. Goodwin, U.S. Environmental Protection Agency, dated August 19, 1980. Comments on draft documents. (docket entry II-D-31)

4. Telecon. Hester, C.I., TRW, Research Triangle Park, N.C., with Don Brenner, Sherwin-Williams, Chicago, Illinois. April 21, 1981. Viscosities of higher solids coatings. (docket entry IV-E-16)

5. Telecon. Hester, C.I., TRW, Research Triangle Park, N.C., with Steve Gunsel, Nordson Corp., Amherst, Ohio. April 23, 1981. Transfer efficiencies of spray application equipment. (docket entry IV-E-17)

6. Products Finishing. July 1981. (docket entry IV-J-2)

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(Please read Instructions on the reverse before completing)

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15. SUPPLEMENTARY NOTES

This document is the second volume of EPA-450/3-80-007 series. The first volume discussed the proposed standards and the resulting environmental and economic impacts.

16. ABSTRACT

Standards of performance are being promulgated under Section 111 of the Clean Air Act to control volatile organic compound (VOC) emissions for new, modified, and reconstructed metal furniture manufacturing plants. This document contains a detailed summary of the public comments on the proposed standards (45 FR 79390), responses to these comments, and a summary of the changes to the proposed standards.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
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