

# **U.S. EPA - METAL FURNITURE MACT DEVELOPMENT**

## **FOURTH ROUNDTABLE MEETING**

EPA Environmental Research Center Building  
Research Triangle Park, North Carolina  
Classroom 3

July 13, 1999

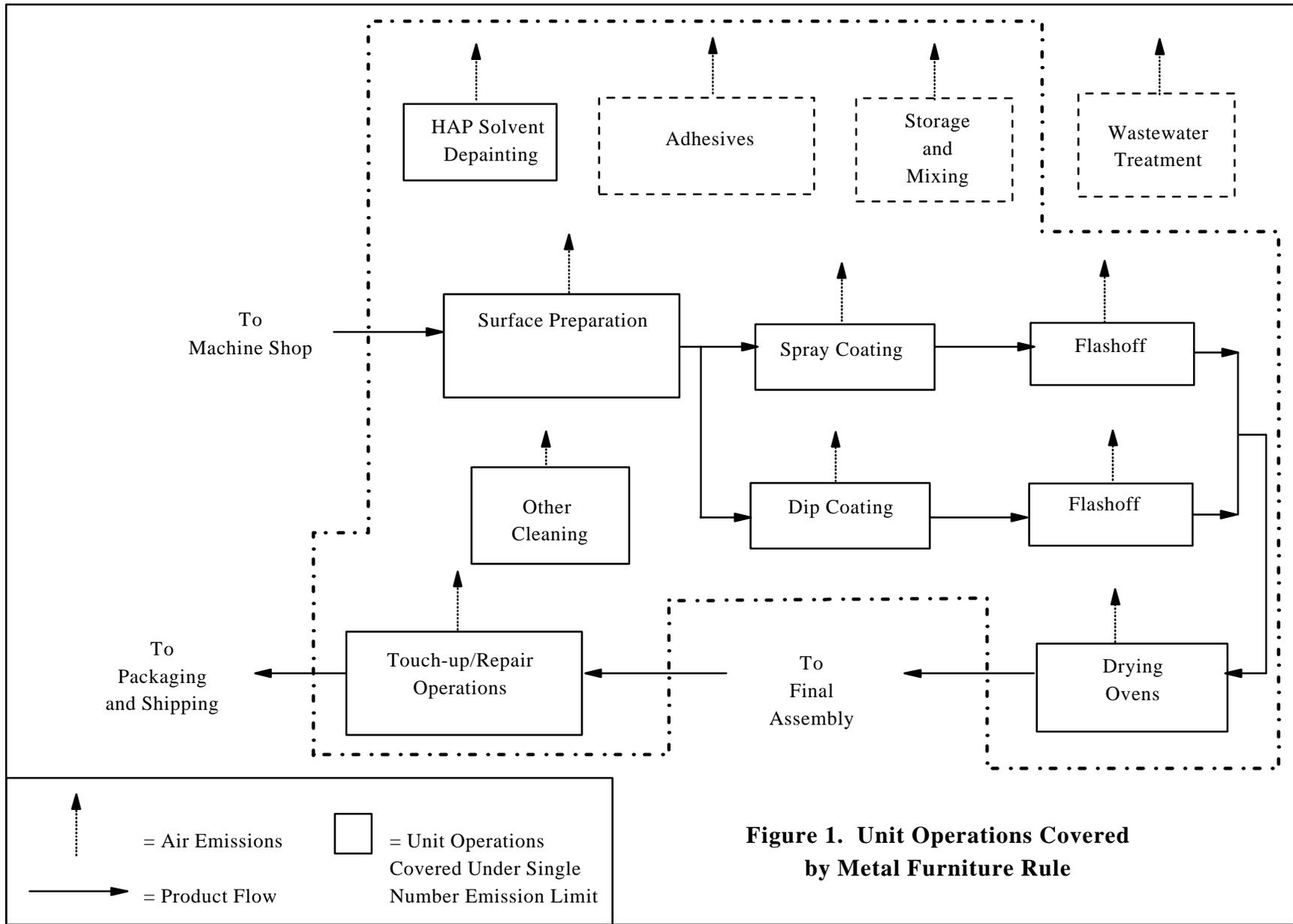
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# OBJECTIVES

Our objectives are:

- Present the methodology we developed to calculate a single-number option for the cleaning and coating operations MACT floor.
- Present the data we have obtained for adhesive operations and options for the MACT floor
- Present our recommendations for other unit operations.
- Hear comments from stakeholders.



## **PROJECT SCHEDULE**

March 1998	Third roundtable meeting
June 1998	Questionnaire sent out
September 1998	Preliminary Industry Characterization completed
July 1999	Draft regulatory options completed
August 1999	Cost, environmental, and energy impacts completed
February 2000	SBREFA panel completes review
March 2000	Submit proposal package to OMB
June 2000	OMB review complete
August 2000	Proposal in the Federal Register

## BACKGROUND

- What is the metal furniture source category?
  - Household furniture, including chairs, tables, bookcases, kitchen cabinets, frames for boxsprings, cribs, and garden furniture. (SIC Code 2514)
  - Office furniture, including chairs, tables, desks, bookcases, file cabinets, partitions, and modular furniture. (SIC Code 2522)
  - Public building furniture, including benches, stadium seating, theater seating, and school furniture. (SIC Code 2531)
  - Office and store fixtures, partitions, shelving, and lockers, including cabinets, counters, display cases, and bar fixtures. (SIC Code 2542)

## **BACKGROUND (cont.)**

- Miscellaneous furniture, including hospital beds, bowling center furniture, and ship furniture. (SIC Code 2599)
- Miscellaneous hardware, including convertible bed mech. (SIC Code 3429)
- Metal stampings, including wastebaskets and metal parts. (SIC Code 3469)
- Wire springs, including furniture springs. (SIC Code 3495)
- Fabricated metal products, including metal chair frames and furniture parts. (SIC Code 3499)
- Residential electric lighting fixtures, including chandeliers, lamps, wall lamps, and metal lamp shades. (SIC Code 3645)
- Commercial and industrial lighting fixtures, including chandeliers and desk lamps. (SIC Code 3646)

## **BACKGROUND (cont.)**

- Laboratory furniture, including benches, tables, and cabinets. (SIC Code 3821)
- Dental equipment, including cabinets and chairs. (SIC Code 3843)
- Miscellaneous furniture such as for beauty and barber shops. (SIC Code 3999)
- Furniture repair, including refinishing and restoration. (SIC Code 7641)

## **BACKGROUND (cont.)**

- We sent questionnaires to 33 companies, which generated responses from 75 facilities.
- Combined with the responses from our P-MACT questionnaire, we have responses from a total of 85 facilities.
- We determined that 62 of these facilities were in the metal furniture source category and entered their responses into our database.
- We estimated that 49 of the metal furniture facilities were major or synthetic minor sources and used these facilities to determine the MACT floor.
- Facilities use solvent-based, water-based, and powder coatings, with solvent-based being most prevalent.

## **BACKGROUND (cont.)**

- The industry does not use add-on controls. Compliance will be driven by low HAP/VOC coatings and powder coatings, which affects our choice for the MACT floor methodology.
- Using the American Business Index and TRI databases, we estimated that 553 facilities may be affected by this rule. Based on the emissions from the 23 facilities in the database for which we had complete information, we estimated the nationwide baseline emissions of these 553 facilities to be 16,300 Mg/yr (14,800 tons/yr).

## BACKGROUND (cont.)

- What are the primary VOHAP emissions?

VOHAP	Emissions* (Mg/yr)	Percent of Total*
Xylene	510	40.2
Toluene	185	14.5
Glycol ethers	176	13.9
2-Butoxy ethanol	117	9.2
Ethylbenzene	83	6.6
Methyl ethyl ketone	59	4.7

\* Total emissions from all survey responses

## BACKGROUND (cont.)

- What are the emissions of VOHAP that are undergoing review for delisting?

VOHAP	Emissions* (Mg/yr)	Percent of Total*
2-Butoxy ethanol (EGBE)	117	9.2
Methyl ethyl ketone	59	4.7
Methyl isobutyl ketone	23	1.8
Methanol	10	0.8

\* Total emissions from all survey responses

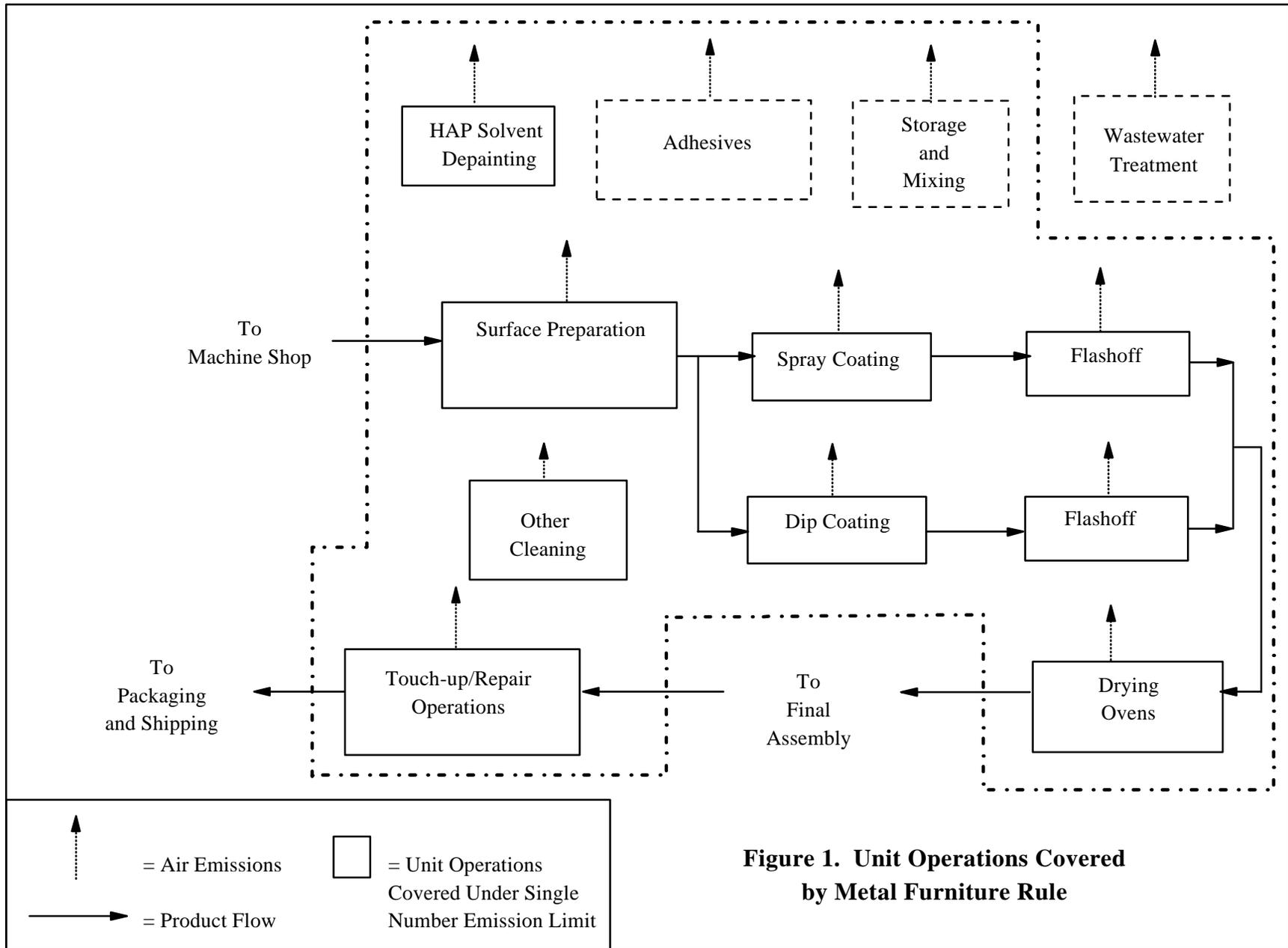
# SUMMARY

- Estimated number of major sources - 553
- Our database includes information on 49 major or potentially major sources.
- Of the 49 facilities in the database, four qualify as small businesses (<500 corporate employees).
- MACT Floor (cleaning and painting) - 0.076 kg VOHAP/liter nonvolatiles (0.63 lb/gal)
- Estimated nationwide baseline emissions for major sources - 16,300 Mg/yr (14,800 tons/yr)
- Estimated nationwide emission reduction for painting and cleaning - 11,700 Mg/yr (10,700 tons/yr), or 72%
- Other unit operations may be covered by work practices and other requirements to be determined.

## **SUPPORTING DOCUMENTATION**

### **What unit operations do we intend to regulate?**

- Figure 1 shows the unit operations typical to the metal furniture manufacturing process. The figure also presents the unit operations we may cover under this rule, as well as the unit operations covered under the single-number limit for cleaning and coating.



## What approach did we use to determine the MACT floor?

We based the MACT floor on facility-wide volatile organic HAP (VOHAP) emissions from cleaning and coating operations normalized by the paint nonvolatiles (solids) used. We used the following procedure to determine the MACT floor value (see Attachment 1 for the database summary and sample calculation):

- Calculated total VOHAP emissions from coating application operations, *assuming that cure volatiles are negligible*.
- Calculated total VOHAP emissions from all cleaning operations (surface preparation and other cleaning).
- Summed the VOHAP emissions from cleaning and coating application operations.
- Calculated the total nonvolatiles (solids) from liquid and powder coatings at major sources.
- Divided the total VOHAP emissions by total nonvolatiles to calculate the normalized facility emission rate in the units of kg VOHAP/liter nonvolatiles.
- We based the top 12% on the number of facilities in the database: 12% of 49 facilities = 5.9, so we used the top 6.
- We calculated the arithmetic average of the top 6 facilities to determine the existing source MACT floor of 0.076 kg HAP/liter nonvolatiles (0.63 lb/gal) (see Table 1).

## **What are cure HAPs and how will they affect the MACT floor?**

- Cure HAPs are compounds not originally present in the coating that are formed by chemical reaction when the coating is cured or dried at elevated temperatures.
- The EPA is currently modifying its existing test method to measure cure HAP emissions from coatings.
- If necessary, the MACT floor value may have to be adjusted to account for cure HAP emissions.
- We need any available data on the amount and speciation of cure HAP (or volatiles) emissions for both liquid and powder coatings. This information should include all coating ingredients, particularly the resin system.

## **What do we propose for unit operations other than cleaning and painting?**

### **A. Adhesive Operations**

A possible option is to include adhesive operations in the single number limit along with cleaning and coating operations. We have not done this yet because of a lack of data. We will continue with this option unless there is a clear reason why emissions from adhesive operations should not be accounted for in this way.

We have several issues to resolve before we can set the MACT floor for adhesive operations:

- We need more information to adequately set the adhesive operations MACT floor.
- How does the type of adhesive (such as hot melt, polyurethane, or waterborne) affect the HAP content?
- How does the application method (such as spray or rollcoat) affect the volatiles/HAP content?
- Do low HAP adhesives readily replace high HAP adhesives?

## **What do we propose for unit operations other than cleaning and painting? (cont.)**

### **B. Other Unit Operations**

- **Mixing and Storage Tanks**

Because we have no reliable means of determining emissions, we will examine work practice standards. While these standards have not yet been established, we anticipate they will consist of keeping tanks covered and proper handling.

- For each of these other unit operations, we may have to determine applicability cutoffs (such as a lower limit on tank size).

## DATA NEEDS FOR COST IMPACTS

In order to complete the estimated cost impact of the standard on the industry, we need the following information:

- Liquid coatings (including adhesives)
  - Cost
  - Physical property data (must include: density, mass percent HAP, volume percent nonvolatiles)
  
- Powder coatings
  - Powder cost
  - Capital cost of coating line (include conveyor speed, maximum part size)
  - Energy requirements
  - Annual costs
  - Cost of temperature/humidity controlled room for powder application
  
- Cleaning materials (for cleaning other than surface preparation prior to coating)
  - Cost of typical HAP-containing material
  - Cost of HAP-free material

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# **ATTACHMENT 1**

## **DATABASE SUMMARY, SAMPLE CALCULATION, AND BASIC DEFINITIONS**

*[insert Table 1] - coatings*

*[insert Table 2] - adhesives*

# Sample Calculation for Facility MFF-04

All calculations were carried to three significant figures. Coating VOHAP emissions assume no cure volatile emissions.

## Step 1: Calculate the VOHAP emissions from coating application operations.

### Solvent-based coating

Usage = 202,562 liters/yr

Average density = 1.28 kg/liter

Volume percent nonvolatiles = 66.30

Mass percent VOHAP = 2.81

$$(202,562 \text{ liters/yr}) \times (1.28 \text{ kg/liter}) \times (2.81/100) = 7,310 \text{ kg VOHAP/yr}$$

### Water-based coating

Usage = 408,897 liters/yr

Average density = 1.22 kg/liter

Volume percent nonvolatiles = 30.38

Mass percent VOHAP = 2.24

$$(408,897 \text{ liters/yr}) \times (1.22 \text{ kg/liter}) \times (2.24/100) = 11,200 \text{ kg VOHAP/yr}$$

## Step 2: Calculate the VOHAP emissions from cleaning operations

This facility reported no VOHAP in any cleaning materials.

## Step 3: Calculate the total VOHAP emissions

$$\text{Total VOHAP emissions} = 7,310 \text{ kg/yr} + 11,200 \text{ kg/yr} = 18,500 \text{ kg/yr}$$

## Step 4: Calculate the total volume nonvolatiles from liquid and powder coatings

### Solvent-based coating

$$(202,562 \text{ liters/yr}) \times (66.30/100) = 134,000 \text{ liters/yr}$$

### Water-based coating

$$(408,897 \text{ liters/yr}) \times (30.38/100) = 124,000 \text{ liters/yr}$$

$$\text{Total volume nonvolatiles} = 134,000 \text{ liters/yr} + 124,000 \text{ liters/yr} = 258,000 \text{ liters/yr}$$

## Step 5: Calculate normalized emission rate

$$\begin{aligned} \text{Normalized emission rate} &= (18,500 \text{ kg VOHAP/yr}) / (258,000 \text{ liters nonvolatiles/yr}) \\ &= 0.0717 \text{ kg VOHAP/liter nonvolatiles} \end{aligned}$$

## DEFINITIONS

*Cleaning operation* means a unit operation in which a substrate is cleaned. This term focuses on what is being cleaned (e.g., spray booth cleaning operation or parts cleaning operation). Cleaning may be performed to prepare a surface for coating or for other purposes.

*Coating* means a material applied onto or impregnated into a substrate for decorative, protective, or functional purposes. Such materials include, but are not limited to, paints, varnishes, sealants, inks, adhesives, maskants, and temporary coatings. Decorative, protective, or functional materials that consist only of solvents, protective oils, acids, bases, or any combination of these substances are not considered coatings for the purposes of this subpart.

*Cure Volatiles* means reaction products which are emitted during the chemical reaction which takes place in some coating films at the cure temperature. These emissions are other than those from the solvents in the coating and may, in some cases, comprise a significant portion of total VOC and/or volatile HAP emissions.

*Depainting/stripping* means removal of a coating from a substrate such as metal hangers by mechanical, chemical, or thermal means. Cleaning of a substrate with solvent or other surface preparation that occurs prior to the coating application operation is not covered by this term.

*Nonvolatiles or solids* means the nonvolatile portion of the coating that after drying makes up the dry film.

*Process (process line)* means the aggregate of unit operations necessary for producing a product. The emissions from a process includes all sources of air emissions (e.g., storage, transfer, handling, mixing, painting, and packaging).

## DEFINITIONS (cont.)

*Unit operation* means an industrial operation, classified or grouped according to its function in an operating environment (i.e., a paint mixing vessel, a spray booth, etc.).

*Unit operation system (UOS)* means the ensemble of equipment around which a material balance is performed. The "boundary" of a UOS may

include one or more unit operations (e.g., a coating line or a coating line plus mixing tanks). What constitutes a UOS for presenting emissions/waste data needs to be defined on an industry by industry basis. However, common UOSs may be found across industries.

*Work Practice* means specific activities that lead to a reduction in emissions (or waste) or have the potential to do so. The activities include operator training, management directives, work procedures or techniques for conducting emission (or waste) generating operations or for reducing or eliminating the need for such operations.