

PRELIMINARY MACT FLOOR ANALYSIS
FOR THE
LARGE APPLIANCES NESHAP PROJECT

Material for Discussion During
Stakeholder Roundtable Meeting
July 14, 1999

Contact Person: 919-541-2379
MOHAMED SERAGELDIN, PH.D.
COATINGS AND CONSUMER PRODUCTS GROUP
EMISSION STANDARDS DIVISION

CONTENTS

- OBJECTIVES
- DEFINITION OF SOURCE CATEGORY
- BACKGROUND
- PRELIMINARY DATA ANALYSIS
- RECOMMENDED MACT FLOOR APPROACH
- EXAMPLE MACT FLOOR CALCULATIONS
- MACT FLOOR DATA TABLE

OBJECTIVES

- To Present the Results of Our Data Gathering Activities and Preliminary Data Analysis
- To Present Our Recommended MACT Floor Approach
- To Present the Preliminary MACT Floor Value

LARGE APPLIANCES SOURCE CATEGORY

The Large Appliances Source Category Includes Facilities Primarily Engaged in Manufacturing The Following Types of Products:

- Household Cooking Equipment; Including Grills, Convection Ovens, Microwave Ovens, Electric And Gas Ranges (Sic Code 3631)
- Household Refrigerators, Iceboxes, Home And Farm Freezers (Sic Code 3632)
- Household Laundry Equipment; Including Washing Machines, Dryers, Drycleaning and Laundry Machines (Sic Code 3633)
- Other Household Appliances; Including Dishwashers, Floor Waxers/Polishers, Garbage Disposal Units, Sewing Machines, Trash Compactors, Water Heaters (Sic Code 3639)
- Heating/ Air Conditioning And Refrigeration Equipment; Including Warm Air Furnaces, Air Conditioning Units, Refrigerated Display Cases, Beverage Dispensing Equipment, Drinking Fountains, Ice Making Machinery (Sic Code 3585)
- Service Industry Machinery Such as Cafeteria Food Warmers, Car Washing Equipment, Corn Popping Machines, Floor Sanding Machines, Water Conditioners, Water Filters and Purification Equipment (Sic Code 3589)

LARGE APPLIANCES MACT FLOOR DATABASE

BACKGROUND

- 400 questionnaires were mailed to facilities that were known to be (or suspected of being) large appliance manufacturers, in an attempt to survey the entire industry
- 221 facilities returned completed questionnaires; this number is believed to include most (80 - 90 %) of the existing large appliance manufacturers
- Of the 221 facilities for which we have some data, 54 facilities are currently considered to be major or synthetic minor sources, and have provided responses complete enough to be included in our MACT floor database
- 33 additional facilities have been identified as probable major sources that can be added to the MACT floor database after we follow-up with the facilities to clarify Questionnaire responses or to obtain missing data from incomplete responses
- About 45 of the 221 facilities in the database are estimated to be small businesses based on reported number of employees (less than 500); this would indicate that about 20 - 25 % of the facilities in the industry may be small businesses

LARGE APPLIANCES PRELIMINARY DATA ANALYSIS

- Typical Unit Operations at a large appliance manufacturing facility that may result in HAP emissions include:
 - metal cutting and forming steps using cutting oils and lubricants
 - metal surface cleaning and pretreating steps
 - bonding of some component parts with adhesives
 - application of one or more layers of coatings
 - cleaning of coating application areas, conveyers, and coated parts
 - storage of coatings, solvents, and cleaning materials
 - mixing of coatings and thinners in mix areas
 - collection and disposal of waste materials

- The coating application unit operation is by far the largest source of HAP emissions, accounting for an estimated 80 percent of emissions from all of the listed activities

- The volume of nonvolatiles (solids) in a coating, which is related to the level of productions, is the most suitable parameter for normalizing facility wide emissions in this industry. An estimated 15 million liters (4.0 million gallons) of coating solids are applied per year in the industry.

- The types of coatings used by large appliance manufacturing facilities and their relative percentage of use (by solids applied) are as follows:

- solvent-based coatings	42 percent
- powder coatings	40 percent
- water-based coatings	18 percent

LARGE APPLIANCES PRELIMINARY DATA ANALYSIS

- The major HAPs emitted from large appliance manufacturing facilities, and an estimate of the percentage of total industry emissions represented by each, are as follows:

- xylene	27%
- glycol ethers	21%
- toluene	13%
- methylene diphenyl diisocyanate	12%
- methyl ethyl ketone	<u>09%</u>
	82%

- Very little emissions data from material storage or waste collection and disposal activities were provided in the questionnaire responses; these activities are not expected to be significant sources of emissions in this industry and they were not included in the MACT floor database

- The extent of the use of cutting oils and lubricants, and the HAP content of these materials, was not addressed in the questionnaire responses in enough detail to include them in the MACT floor database; these materials are being investigated and, if justified, they will be added later

- The use of adhesives occurs at a relatively small number of facilities (about 20 % of those that submitted responses), but was included in the MACT floor database because of the potential for significant emissions at some facilities

- Reformulation of coatings and cleaning materials to reduce the HAP content and conversion to non-HAP emitting powder coatings are expected to be the methods of complying with the NESHAP

RECOMMENDED MACT FLOOR APPROACH

The project team's recommended approach for calculating the MACT floor is to determine a facility-wide average HAP value based on the volume of coating solids applied by a facility, as follows:

- total HAP emissions from all surface coating-related operations (coating application operations, adhesive application operations, and cleaning operations) were determined for each facility in the MACT floor database
- the total volume of coating solids (nonvolatiles) from all types of coatings (except adhesives) was determined for each facility in the MACT floor database
- total HAP emissions from the affected unit operations were divided by the total nonvolatiles (solids) in the coatings to *normalize* emissions for each facility (i.e., kg HAP/L solids)
- facilities were ranked in order of their normalized emissions, lowest to highest
- the top 12% of the facilities were determined based on the number of facilities in the MACT floor database ($54 \times 0.12 = 6.48 \Rightarrow 7$)
- the floor was calculated as the arithmetic average of the normalized emissions of the top 12% of the facilities

Hence, the MACT floor is equal to **0.15 kg HAP/L solids** (1.2 lb/gal)

Estimated HAP emission reduction resulting from implementing the MACT floor level of control at existing major sources is 71 % . The emissions were reduced from 2,046 Mg. to 588 Mg (2,248 ton to 646 ton).

ASSUMPTIONS AND POTENTIAL ISSUES

- Potential major sources were determined by selecting; (1) those facilities that listed "major source" or "synthetic minor source" as their Title V status on their questionnaire response, (2) those facilities that reported their HAP emissions under "maximum design capacity" as greater than 9.1 Mg., and (3) those facilities that listed "area source" or "unknown" as their Title V status, reported actual HAP emissions of greater than 3 Mg., and did not report a "maximum design capacity" were assumed to have the potential to increase their emissions to 9.1 Mg.
- Unit operations for which we gathered some data (cutting oils and lubricants operations, storage tanks, and waste storage operations) do not, in general, appear to contribute enough HAP emissions to justify the development of numerical emission limits.
- Emissions from adhesives operations are currently incorporated into our MACT database for determining the floor and calculating the emissions reduction. We may decide later to establish a separate HAP content limit for adhesives. If we remove emissions from adhesive operations from the database, it would not change the MACT floor, but would lower the estimated emissions reduction to about 65%.
- We have not found at this point a need to subcategorize.

EXAMPLE MACT FLOOR CALCULATION

- The MACT floor is the arithmetic average of the emission limits achieved by the best performing 12 percent of the facilities in the MACT floor database
- With 54 facilities in the current MACT floor database, the best performing 12% of these facilities would include: $54 \times 0.12 = 6.48$ facilities; because this is greater than 6 facilities, we used **7 facilities**
- These 7 MACT floor facilities (shaded on Table 1) have reported emission limits as follows:

<u>FACILITY</u>	<u>EMISSION LIMIT</u> (kg HAP/L solids)
A	0.0432
B	0.0808
C	0.1429
D	0.1572
E	0.1918
F	0.2008
G	<u>0.2150</u>
	1.0317

- The MACT floor is the arithmetic average of the emission limits of these 7 facilities
- The arithmetic average of these 7 facilities' emission limits is calculated by dividing the sum of the limits (1.0317) by the number of facilities (7): $1.0317/7 = \mathbf{0.15}$
- The MACT floor is: **0.15 kilograms of HAP per liter of solids (nonvolatiles) in the coatings applied**