BACKGROUND INFORMATION FOR METAL COIL SURFACE

COATING EMISSION FACTORS

The basis for the emission factors presented in Table 1 are small, medium, and large model plants that were developed from a survey conducted by EPA's Effluent Guidelines Division of the Office of Water and Waste Management. Seventy-two plants responded to the survey by supplying information describing the operating characteristics of their coil coating lines. The 72 lines were divided into three approximately equal groups to represent large, medium, and small operations. Representative plants, having operating conditions approximately equal to the average in each group, were selected from each group for use as the basis of analysis in the background study for an NSPS. The line speed and width of metal processed for each of these plants are as presented in Table 2.

The total dry film thickness used in the calculation of emission factors was based on the assumption that two coating applications are made on each side of the metal with a resulting dry film thickness of 1.0 mil on the front side and 0.8 mil on the back side. Information on which this assumption is based was obtained from numerous plant visits and contacts with industry personnel. The four-coat system is generally representative of the coating of steel but is less typical of the coating of aluminum. Aluminum is often coated with 1, 2, or 3 coats although 4 coats may also be used.

Coating formulation data were obtained from the coil coating CTG document and from contacts with coating manufacturers and coil coaters. Data pertaining to VOC content of solvent borne coatings are presented below.

Coatings	Volatile content, weight percent
Acrylics	40-45
Adhesives	70-80
Alkyds	50-70
Epoxies	45-70
Fluorocarbons	55-60
Organosols	15-45
Phenolics	50-75
Plastisols	5-30
Polyesters	45-50
Silicones	35-50
Vinyls	60-75
Zincromet (TM)	35-40
Dacromet (TM)	No data

The volatile content by volume is approximately 10 percent greater than the content by weight. Using this figure and taking a simple average of the VOC contents of the coatings listed results in a value of 60 percent, which was used as the average VOC content of coatings in the average emission factor calculations. Values of 20 percent and 80 percent by volume, which is near the extremes in the above listing, were used to compute minimum and maximum emission factors. No data were available on the usage of each type of coating by the coil coating industry, which forced the use of an arithmetic average rather than a weighted average VOC content.

Data pertaining to waterborne coatings were obtained from eight coatings manufacturers. These data result in an average VOC content of approximately 10 percent by volume and a solids content of approximately 40 percent by volume. These values are also arithmetic averages because no usage data were available from which to compute weighted averages.

Specific data relating to capture efficiency of VOC emissions are not available but statements submitted by the National Coil Coaters Association indicate that 95 percent is a reasonable value. This figure was, therefore, used in the calculation of emission factors for controlled coil coating lines.

Incinerator destruction efficiency from five emission tests indicate that 95 percent destruction is achievable if the incinerator is operated at 1,400°F or higher. This figure, when combined with the 95 percent capture efficiency results in an overall reduction of 90 percent. The emission factors for controlled lines that use solvent borne coatings were computed by reducing the uncontrolled values by 90 percent.

Emission factors were computed using the following equations:

$$\text{Mass of VOC per hour} = \frac{\frac{\text{Area coated}}{\text{hour}} \times \text{total dry film thickness} \times \text{Volume fraction VOC content} \times \text{VOC density}}{\text{Volume fraction solids content}}$$

$$\text{Mass of VOC per unit area coated} = \frac{\text{Mass of VOC per hour}}{\text{Area coated per hour}} .$$

Using information from Table 2, the average uncontrolled emission factor for plants that use solvent borne coatings was computed as follows:

$$\text{Mass of VOC per hour} = 300 \frac{\text{ft}}{\text{min}} \cdot 60 \frac{\text{min}}{\text{hr}} \cdot 3 \text{ ft} \cdot 0.0018 \text{ in} \cdot \frac{0.60}{0.40} \cdot 7.36 \frac{\text{lbs}}{\text{gal}} \cdot 7.48 \frac{\text{gal}}{\text{ft}^3} \cdot \frac{1 \text{ ft}}{12 \text{ in}}$$

$$\text{Mass of VOC per hour} = 669 \text{ lbs/hour}$$

$$\text{Mass of VOC per unit area coated} = \frac{669 \text{ lbs/hr}}{(300 \text{ ft/min})(60 \text{ min/hr})(3 \text{ ft})} = 0.0124 \text{ lbs/ft}^2$$

The other emission factors were computed by the same procedure using the data in Table 2.