10/06/1978 VOC561006781

Category: 56 – VOC Control Technology (Paint Spray Booth Design)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

DATE: October 6, 1978

SUBJECT: Comments on Auto Industry Proposals

FROM: Richard G. Rhoads, Director
Control Programs Development Division

TO: Director, Air and Hazardous Materials Division, Regions I, III-X
Director, Environmental Programs Division, Region II

A number of States and Regional Offices have requested OAQPS comments on auto industry proposals which differ from limits in the Control Technology Guidelines (CTG). Rather than review each proposal individually, we have aggregated the key issues raised in each and addressed it in the enclosed memorandum. This memorandum should be considered a supplement to the CTG and a clarification of EPA policy for the review of State SIP submittals.

Any questions or comments on this memorandum should be directed to John Calcagni at FTS 629-5365.

Enclosure

Enclosure

AUTOMOTIVE AND LIGHT TRUCK ASSEMBLY COATING OPERATIONS

A number of States have received suggestions and proposed standards for the control of auto and light truck assembly operations. The principle issues raised by these comments related to:

- RACT for prime application
- RACT for topcoat application
- Averaging times for the emission limits
- Case-by-case review
- Compliance schedules

Our findings and guidance on these issues are as follows:

PRIME APPLICATION OPERATIONS

The prime cost serves the dual function of protecting the surface from corrosion and providing for good adhesion of the topcoat. A combination of manual and automatic spray methods, with or without the use of electrostatic techniques, is usually used to apply organic solvent-borne primer.

Primers may also be applied by dipping techniques. The Chrysler Corporation, for example, used water-borne dip primers for underbodies at some of its plants. Because the dip-coated primer is not smooth, the coating must be sanded or else be used only on areas where appearance is not important.

Of most interest from a pollution control standpoint is a relatively new priming process, electrophoretic (electrodeposited) water-borne dip. The object to be coated is immersed in a water-borne coating and an electric potential is induced between the vehicle and the coating bath. By correctly setting the electrical potential and the time of the bath, the coating thickness can be controlled as desired. Corrosion protection is excellent because coverage is more complete than can ever be obtained by spray priming alone. The electrophoretic dip process is used at over 40 percent of U.S. assembly plants and is very widely used in Europe.

Because of the uniformity of the electrodeposited coating, it does not "mask" imperfections in the substrate and additional primer must be sprayed on those areas for subsequent sanding. This additional primer, called "surfacer" or "guidecoat," is available as either a water-borne or organic solvent-borne coating.

The EPA recommendation of 1.9 lb/gal (less water) was based on a weighted average of the two essential components in this system: 0.8 lb/gal coating used in the anodic electrodeposition (EDP) process then in use and a 2.8 lb/gal (less water) coating for the surfacing operation.

The industry comments on the prime application operations have questioned the availability of cathodic EDP coatings at the same solvent content as anodic EDP. Cathodic EDP is a new development in EDP coating and is considered to be a superior technology because it markedly improves the

corrosion resistance. Our investigation on this matter concluded:

- Anodic EDP coatings are available at .8 lb/gal (less water).
- Presently used anodic EDP coatings are 1.2 lb/gal (less water).
- Presently used cathodic EDP coatings are between 1.8 and 2.1 lb/gal (less water).
- Coating manufacturers have committed to providing cathodic EDP coatings at 1.2 lb/gal (less water).

In terms of emission/year, a typical EDP line (coating 40 intermediate size vehicles per hour) using a .8 lb/gal (less water) coating consumes 15 tons/year while a 1.2 lb/gal (less water) coating consumes 26 tons/year and a 2.1 lb/gal (less water) coating consumes 54 tons/year. Test results have shown approximately two-thirds of this solvent consumption from an EDP process is removed from the system by the waste water stream reducing the emissions from the oven and dip tank to a third of these values. Accordingly, State regulations should require EDP but at less stringent limits than 0.8 lb/gal. Based on the available data, we believe a regulation which calls for EDP at 1.2 lb/gal (less water) for prime application would allow the use of either cathodic or anodic EDP even though cathodic EDP coatings at less than 1.8 lb/gal (less water) are not commercially available today.

For surfacing operations, the EPA recommended limit of 2.8 lb/gal, equivalent to a 62 percent solids coating, is based on a conventionally applied water-borne coating which was in use in two plants in this country. We anticipate that conversion to a water-borne surface will be the preferred compliance technique for approximately 50 percent of the industry.

In evaluating equivalence to the CTG, it is important to consider transfer efficiency. Electrostatically sprayed coatings offer a marked advantage over conventional spray coatings in that the overspray (or wasted material) is reduced from about 50 percent to 30 percent. Unfortunately, water-borne coatings are not presently applied electrostatically in the automotive industry because of some safety problems. Considering the higher transfer efficiency, a 55 percent solids organic-borne surfacer applied electrostatically can be considered equivalent to the EPA-recommended limit of 2.8 lb/gal. Although a 55 percent solids prime coat is not presently available, if it can be developed, it would be preferred option for a significant fraction of the industry. It should also be noted that a shortfall from the 55 percent solids coating probably can be made up through the addition of add-on controls such as incineration of the prime oven emission, or carbon adsorption on the spray booth and flash off areas.

TOPCOAT APPLICATION OPERATIONS

The area receiving the most comment has been the appropriate control levels for topcoat application. The EPA-recommended limit of 2.8 lb/gal was based on a conventionally sprayed water-borne enamel coating presently being applied at two automotive assembly plants in California. Consequently, there can be no argument as to the technical feasibility of achieving 2.8 lb/gal.

At many of its plants, General Motors uses lacquers for the topcoat. Lacquers have an extremely high solvent content (=88 volume percent). Ford, American, and Chrysler use topcoat enamels with 65 to 78 percent solvent by

volume. Volkswagen expects to use topcoats with only 30 volume percent solvent equivalent by 1981.

A number of major process modifications are necessary, however, to retrofit water-borne coating technology to an existing plant. This includes the lengthening or addition of new ovens and flash tunnels, humidity and temperature controls in the spray booths, increased sludge handling capabilities, provisions for additional power, and use of more corrosion resistant materials in the piping and spray booth construction.

The cost of this retrofitting will vary and one major variable will be the age of the existing coating equipment. If near retirement, it may be better to build entirely new spray booths and ovens. This was done at one of two automobile plants which converted to water-borne coatings. If the coating equipment is still relatively modern, however, retrofitting will entail lengthening of ovens and modification of spray booths and conveyors. This was the approach taken at the other automobile plant using water- borne topcoats. While costs will vary from plant-to-plant, capital costs for a retrofit to water-borne topcoats for the "model plant" were estimated by EPA to be about $20 million (1975 dollars). For a plant where the entire coating line is replaced, capital costs can be about twice this.

Incremental operating costs include increased electrical requirements and maintenance labor. Coating material costs are approximately the same. Higher oven temperature causes an increase in natural gas usage.

Actual conversion to water-borne coatings may not be the only way to achieve the emission levels represented by 2.8 lb/gal. For example, emissions from electrostatic application of an organic-borne topcoat of 55 percent solids (with a transfer efficiency of 70 percent) is equivalent to conventionally sprayed water-borne coating with 2.8 lb/gal (less water) of solvent. Electrostatic application of a 50 percent solids coating (with a 70 percent transfer efficiency) would require an additional 16 percent reduction of the organic solvent through add-on controls in order for it to emit no more than the water-borne. These reductions may be achieved through incineration of oven emissions and/or carbon adsorption of a portion of the spray booth emissions.

It should be noted that while carbon adsorption of the spray booth emissions is technically feasible, no full-scale installations are currently in operation in automobile plants although the two major manufacturers both have large scale pilot studies underway. If a coating with a reasonably high solids content (50-55 percent) becomes commercially practicable for the automobile topcoat, the costs for add-on controls to provide incremental reductions would be significantly less than the cost of converting to an all water-borne operation. Naturally, if future organic-borne enamel coatings fall short of 50 percent solids, a greater reliance on add-on control would be necessary. For example, a 45 percent solids coating with a 70 percent transfer efficiency would require a 31 percent reduction from add-on controls.

AVERAGING TIMES

The 2.8 lb/gal (less water) limit chosen represents a typical color being used. Some of the light metallic colors require greater solvent content

(as high as 3.1 lb/gal). If the 2.8 lb/gal (less water) value is interpreted as a maximum not to be exceeded, this would likely constrain the availability of certain colors. Suggestions have been made by the automotive industry that this should be an average. If a State regulation expresses this limit as a daily weighted average or arithmetic average of the colors in use (so long as the limit is unambiguously expressed and legally enforceable), OAQPS would not regard that as being perceptibly different than the recommended limit.

CASE-BY-CASE REVIEW

Arbitrary variation from the recommended limits is not appropriate. However, the recommended limits are presumptive norms for the category in question, not absolutes for each individual plant. If facility specific problems unique to a given plant are identified, these should be considered on a case-by-case basis. In any circumstance where the State requirements vary from the recommended limit, the SIP must provide adequate technical information to support the modification. Individual source specific regulations or variances are appropriate if:

1. The recommended limit is inappropriate for an individual source because of specific circumstances unique to the particular facility;

2. The proposed level of control is the maximum reasonably attainable by the operation in question. Specific consideration should be given to the feasibility of development of technology to comply with a value at or near the recommended value; and

3. The reasonable further progress demonstration is not violated.

It should be noted that any change made after the initial submittal will have to be a SIP revision and that the revision must provide a means to account for the increased emissions in the SIP. This could be through such measures as offsets by the sources, plans for additional reductions to be obtained by the State beyond what the SIP called for, or a reduction in the growth increment. In brief, the plan must continue to demonstrate a program for attainment.

COMPLIANCE SCHEDULES

Where source specific schedules cannot be proposed, OAQPS recommends that the SIP contain categorical compliance dates for each source category. A categorical schedule for any CTG categories must have increments of progress which are as expeditious as practicable. This schedule should reflect the minimum reasonable time necessary for a typical individual source to install controls. However, that is not to say that all sources must comply by that date. Individual extensions beyond this date, but not later than the attainment date, may be acceptable on a case-by-case basis if:

1. The State demonstrates that it is physically impossible for the operation in question to comply with the date.

2. That, by allowing additional time, innovative technology will be applied and the reductions to be achieved will be significantly

greater than that from the CTG RACT value (this ultimate limitation must be legally enforceable).

3. Additional time is necessary to allow for the development of low solvent systems rather than apply add-on controls.

4. The operation in question is part of a Statewide or multi-state program to prioritize the sequence of installing controls at a number of similar operations and that the overall compliance program has been approved as being expeditious as practicable.

Note that any modification of the compliance schedule beyond December 31, 1982, will need to be a SIP revision and will impact the evaluation of reasonable further progress (RFPs). In no case should compliance with RFPS be waived. Hence, an alternative schedule beyond 1982 can be approved only if the RFPS program is modified to reflect the delays.