
Air



Alternative Control Techniques Document: Offset Lithographic Printing

Supplemental Information Based on

Public Comment on

Draft Control Techniques Guideline

Announced in Federal Register on

November 8, 1993



AEST

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Emission Standards Division

U.S. ENVIRONMENTAL PROTECTION AGENCY

Office of Air and Radiation

Office of Air Quality Planning and Standards

Research Triangle Park, North Carolina 27711

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1.0 INTRODUCTION

The purpose of this document is to provide information on alternative control techniques (ACT) for volatile organic compound (VOC) emissions from offset lithographic printing. A draft control techniques guideline (CTG) for this industry was made available for public comment on November 8, 1993. Over 20 comment letters were received. In developing this ACT document, we solicited additional information to help us clarify and understand the basis for the comments on the draft CTG. We have considered all of the additional information we received, along with the comments, in preparing this document.

This document supplements the draft CTG. The draft CTG should not be used alone, but rather in conjunction with this document. This document provides additional information that States can use in developing rules based on reasonably available control technology (RACT).

The discussion of comments on the draft CTG is presented in the following sections:

- Applicability
- Fountain Solution
- Cleaning Solvents
- Carryover to Heatset Dryers
- Compliance Demonstration

2.0 APPLICABILITY

The draft CTG did not suggest a lower size cutoff for applicability of the recommended levels of control. The recommended control levels were believed to represent reasonably available control technology (RACT) for offset lithographic printers of all sizes.

Several commenters asked that the EPA advise States that in order to be consistent with the requirements of the Clean Air Act that the recommendations in the draft CTG should only be applied to major sources in ozone non-attainment areas. The EPA disagrees with this interpretation of the potential applicability of the recommendations in a CTG.

Many of the CTGs developed under the 1977 Clean Air Act Amendments include a recommendation to apply the guidance to sources that are much smaller than major sources. For most coating industry CTGs, there was no cutoff specified in the CTGs themselves, but a general lower size cutoff of 15 pounds per day actual VOC emissions without control devices from all activities in the particular CTG category was suggested by EPA in other related guidance and adopted into many State regulations. Under the 1990 Clean Air Act Amendments, one of the categories for which a CTG was to be developed was automobile refinishing. This is a category that has few, if any, major sources, and thousands of smaller sources. There would have been no reason to develop a CTG for automobile refinishing if it could not be applied to sources that were not major sources.

If the offset lithography CTG were made final an applicability cutoff of 15 pounds per day actual VOC emissions without control devices from all offset lithographic printing activities (inks, coatings, blanket and roller washes and fountain solution) would likely have been included to be consistent with other CTGs. When an applicability cutoff is

recommended in a CTG, a state may choose to have its regulations apply to sources whose emissions are less than the cutoff level recommended in the CTG, or to seek approval of a higher applicability cutoff.

For sources for which a CTG has not been issued, the statutory requirements are that RACT be applied to major stationary sources in moderate and worse ozone nonattainment areas [Section 182(b)(2)(C)], and ozone transport areas [Section 184(b)(2)2]. Major non-CTG sources in marginal ozone nonattainment areas may also be subject to RACT [Section 182(a)(2)(A)].

All emissions from 1) non-CTG activities at the source and 2) CTG activities at the source that are below the applicability cutoff(s) of the RACT regulation(s) for those activities are included in determining whether the source is major with respect to these requirements. If a source is major with respect to these requirements, then RACT must be applied to all of the non-CTG activities at the source. This means that in the absence of a CTG for offset lithographic printing, RACT is required to be applied to offset lithographic printing activities at a source that is major with respect to Sections 182(b)(2)(C) or Section 184(b)(2). In the absence of a CTG for offset lithographic printing, RACT may also be required to be applied to offset lithographic printing activities at a source that is major with respect to Section 182(a)(2)(A). These requirements apply even if the offset lithographic printing activities at the source are not themselves sufficient to be major.

A state may choose to regulate emissions from non-CTG activities at sources that are not major with respect to Sections 182(b)(2)(C), 184(b)(2), or 182(a)(2)(A). This means that in the absence of a CTG for offset lithographic printing a state may choose to regulate emissions from offset lithographic printing

activities at sources that are not major sources with respect to Sections 182(b)(2)(C), 184(b)(2), or 182(a)(2)(A).

3.0 FOUNTAIN SOLUTION

The draft CTG recommended different levels of VOC (alcohol or alcohol substitute) content for fountain solution, as used, for various types of offset printing. These recommendations were based on information gathered from printers and suppliers, and on the Maryland state regulation. The State indicated in its comments that printers have complied with the limits in this regulation. This comment was confirmed by representatives of two trade groups for printers in Maryland.

Several commenters suggested that the limits for fountain solution should allow for greater use of alcohol. No specific evidence of a widespread need for greater alcohol levels was presented. Some printers may need and be able to justify higher limits on a case-by-case basis. Some commenters noted reverse printing (dark colored ink covers most of substrate with image or text formed by paper showing through intentional voids in the dark colored ink) and jobs done with metallic inks as examples of when it is more difficult to eliminate or reduce the use of alcohol. The ability to obtain and maintain the proper balance of ink and fountain solution on an offset lithographic printing press is a function of many factors including the press, dampening system, rollers, ink, paper, water quality, and operator training and skill.

Several commenters suggested that the VOC limit for alcohol substitutes be 5 weight percent instead of 3 weight percent. This change makes sense for several reasons. The recommended limit in the draft CTG for sheet fed printers was 5 weight percent alcohol (without refrigeration). Emissions from a fountain solution containing 5 weight percent alcohol substitute would still be less than at 5 weight percent alcohol because of the faster evaporation rate (higher volatility) of alcohol. Five weight percent alcohol substitute is also a practical limit on

alcohol substitute content for all types of offset printers because at or above this level ink drying problems will result. Allowing the use of fountain solutions that contain up to 5 weight percent alcohol substitutes could make it easier for some printers to eliminate the use of alcohol.

Some sheet-fed printers run their presses with a mix of alcohol and alcohol substitutes in the fountain solution for certain jobs. Having a single VOC content limit for sheet-fed printers for alcohol, alcohol substitutes, or a combination of the two would simplify compliance demonstrations in these cases.

Several commenters suggested that the definition of alcohol (as used in fountain solution) include normal propyl alcohol and ethanol in addition to isopropyl alcohol. We agree with this comment.

Several commenters also suggested that the baseline level of alcohol assumed in the model plants on the draft CTG was too high. The baseline levels assumed were 10 weight percent alcohol for non-heatset web, 17 weight percent alcohol for heatset web and sheet-fed, and no alcohol for newspaper. The commenters suggested that the average/typical level of alcohol used by all printers still using alcohol was around 10 weight percent, and also noted that many printers have already eliminated the use of alcohol. We agree with this comment and note that the reductions for an individual plant can be estimated, either directly or using tables in the draft CTG, based on knowledge of the starting and ending VOC levels in the fountain solution, the type of VOC used (alcohol or alcohol substitute), and whether the fountain solution is refrigerated.

4.0 CLEANING SOLVENTS

The draft CTG recommended a 70 percent reduction in VOC emissions from cleaning solvents through the use of materials that, as used, contain no more than 30 weight percent VOC. This recommendation was based on waterbased cleaners. There are a number of low VOC cleaners available. These products are both waterbased and vegetable oil based. The current use of these low VOC cleaners is limited. They have not been used in all segments of the offset printing industry. Research, development, production trials and expanded production use of these materials continues.

Several commenters suggested that as an alternative to low VOC cleaning materials, that printers also should have the option of reducing VOC emissions from cleaning by using cleaning materials with low vapor pressure. These commenters referred to the South Coast Air Quality Management District (SCAQMD) Rule 1171 which limits the VOC composite partial vapor pressure of cleaning materials for offset printing to 25mm Hg at 20°C. (The definition of VOC composite vapor pressure from the SCAQMD rule 1171 is provided in Appendix A to this document.) Comments from the SCAQMD suggested that the VOC composite partial vapor pressure of cleaning materials could be limited to 10mm Hg at 20°C. The VOC composite partial vapor pressure of most cleaning materials used to meet the SCAQMD requirement is less than 10mm Hg at 20°C. The VOC composite partial vapor pressure of solvents used in automatic blanket washing systems is commonly less than 6mm Hg at 20°C. The use of cleaning materials with a VOC composite partial vapor pressure less than 10mm Hg at 20°C would result in a comparable emission reduction to using cleaning materials that contain less than 30 weight percent VOC.

A new development in the area of cleaning solvents is the availability of an offset lithographic ink that can be cleaned with water. This ink was developed by Deluxe Corporation and has been put in use at over 40 of their facilities since early 1993 in non-heatset web and sheet-fed production printing of checks and business forms. This ink is being used by other printers in production printing of greeting cards and brochures. Testing is being done on applying this ink to other end uses including heatset web printing.

Several commenters noted that in the draft CTG it was assumed that 100 percent of the VOC in the cleaning materials evaporated and was emitted. The comments noted that towels used for manual cleaning are still wet when cleaning is completed and that when the towels are kept in a closed container after use that they are still wet when sent for laundering or disposal (e.g., burning in a cement kiln). Further, some printers and some industrial laundries have installed centrifuges (extractors) to spin solvent out of used shop towels. This recovered solvent can be reused, distilled, rerefined or combusted. For cleaning materials with a VOC composite partial pressure less than 10mm Hg at 20°C about 50 percent of the VOC may remain in the towel after use. To limit evaporative losses, cleaning materials and used towels must be kept in closed containers.

In some automatic blanket washing systems, there may be collection of some of the liquid cleaning materials. An example would be overspray from the wetting of brushes or rollers. Clearly any material that is collected as a liquid for reuse or disposal has not evaporated. Further, the amount of cleaning material used in automatic blanket washing may be more closely controlled and may be less than is used in manual cleaning. There may also be carryover of automatic blanket wash material into heatset dryers where the carryover material can be controlled by the same device used to control ink oil emissions

from the dryer. This is discussed in more detail in the section below on carryover to heatset dryers.

Several commenters asked that the applicability of the recommended limits for cleaning materials be clarified. The limits were intended to apply to blanket and ink roller washes.

5.0 CARRYOVER TO HEAT SET DRYERS

Several commenters noted that there was no mention in the draft CTG of the carryover of VOC from cleaning solvents and fountain solutions into heatset dryers. These comments focused on carryover of cleaning solvent from automatic blanket washing and alcohol substitutes from fountain solution. Carryover is important because the same control device that reduces ink oil emissions from the dryer exhaust can also control cleaning solvents and fountain solution materials that are exhausted from the dryer.

The first evidence of carryover of VOC from automatic blanket washing systems was fires and explosions in dryers. These resulted from a build-up of VOC from the cleaning solvents. A great deal of safety planning and engineering now goes into the design and operation of automatic blanket washing systems to prevent such incidents.

Determination of the amount or fraction of blanket wash or fountain solution VOC that is exhausted from the dryer is difficult because of the relatively low ratio of the amount of VOC from blanket wash and fountain solution (particularly when alcohol substitutes are used in the fountain solution) to the amount of VOC from ink oil VOC that evaporates in the dryer. The results of some tests were submitted in response to the draft CTG. These tests indicated that a considerable portion of the VOC from cleaning solvents used in automatic blanket washing systems and from alcohol substitutes used in fountain solution can be captured in and exhausted from the dryer.

For automatic blanket washing, direct capture in each of two separate tests at different facilities averaged around 40 percent. Direct capture refers to the fraction of the VOC used in the blanket wash that is carried into the dryer on the web (printed substrate) immediately after the blanket wash. The

automatic blanket wash materials used in both tests all had vapor pressures less than 10mm Hg at 20°C.

In the first test, a limited number of measurements were made on a production press at a printing facility. In the second test over 100 measurements were made under various press, dryer and automatic blanket washer operating conditions on a production size press at a pressmakers facility. Since there were a large number of runs at a variety of operating conditions in the second test and the results from the two tests were similar, 40 percent direct carryover of VOC from automatic blanket washing is a reasonable general assumption when the vapor pressure of the cleaning material is less than 10mm Hg at 20°C.

In the test conducted at a printing facility, a separate measurement was made of indirect capture. This refers to VOC from blanket washing that is first dispersed in the pressroom air and subsequently drawn into the dryer through the make-up air inlets over a long period of time. This VOC enters the pressroom air in various ways including as overspray from the process of wetting the cloth that wets and cleans the blanket, and from evaporation from the cloth over a period of time. In this test almost 40 percent of the VOC in the blanket wash material was found to be indirectly captured in the dryer. Since test results on indirect capture were presented for just one facility at its particular operating conditions and the amount of indirect capture would be affected by press and pressroom ventilation practice, no general assumption is made in this document about indirect carryover of VOC from automatic blanket wash materials.

For fountain solution, direct capture of VOC from alcohol substitutes was measured at a variety of operating conditions on the production size press at the pressmakers facility. The average result was about 70 percent direct capture. Since there were a large number of runs at a variety of operating conditions in the fountain solution test, 70 percent direct carryover of VOC

from alcohol substitutes in fountain solution is a reasonable general assumption.

6.0 COMPLIANCE DEMONSTRATION

6.1 FOUNTAIN SOLUTION

Several commenters suggested changes in the recommendations for compliance demonstration and monitoring for fountain solution.

The fountain solution on most presses flows through a recirculating system. A system may be dedicated to a single unit on a press, service an entire press, or even provide fountain solution to multiple presses. A recirculating system includes a tank (reservoir), pump(s), pipes or tubes, and a tray for each unit served by the system. (On smaller presses, fountain solution may be fed to the tray from a bottle, without recirculation.) A roller picks up fountain solution from the tray and delivers some of it via a series of rollers and sometimes a brush to the printing plate.

On some presses the only material added to the recirculating system is press ready fountain solution. In these cases, knowing that the VOC content of each addition of press ready material to the recirculating system is within the VOC content limit is sufficient to know that the material on press (i.e., in the recirculating system) is also within the VOC content limit.

The VOC content of press ready material can be determined analytically from a sample taken before it is added to the recirculating system, or by having analytical data for the constituents of the press ready mix and combining the results based on the proportions in which they are mixed to make press ready material. The analysis of the constituents of the press ready mix can be performed by the supplier of each constituent.

On some presses there are times when VOC containing materials other than press ready fountain solution (e.g., alcohol or VOC containing alcohol substitute concentrate) are added directly to the material already in the recirculating system.

These direct additions may be made automatically or manually. In these cases some information is needed about the VOC content of the material in the recirculating system after the direct addition is made to check that the material on press is still within the VOC content limit.

After an automatic addition is made, the check on the VOC content of the on press material could be based on the control settings of the automatic feed equipment which makes additions of VOC containing ingredients up to a pre-set level. The equipment used to make automatic additions would have to be operated properly, and records would have to be kept to document that the calibration of the equipment was checked periodically. Alternatively, a sample can be taken from the recirculating system. This sample can either be analyzed directly for VOC content or analyzed with an instrument such as a hydrometer, refractometer or conductivity meter that has been calibrated against the VOC content limit for the fountain solution and some lower VOC content [e.g., no VOC (i.e., the water used in the fountain solution), the desired VOC content, or some point in between] and verifying that the reading for the on press material is in the proper range.

After a manual addition is made, the check on the VOC content of the on press material can be made using the same sampling and analysis procedure described above for automatic additions. Alternatively, if the quantity and VOC content of the material on press before the addition is known, then the VOC content of the material on press after the addition can be calculated by combining the before addition information with the quantity and VOC content of the material added.

6.2 METHODS 25 AND 25A

Several commenters noted that the information in the draft CTG concerning when to use Method 25 and when to use Method 25A

for compliance testing of control devices on heatset dryers was not consistent with the latest guidance from EPA on this subject. We agree with this comment. We agree that the latest guidance should be used. A copy of the latest guidance from EPA (October 25, 1993 memorandum from John B. Rasnic, Director, Stationary Source Compliance Division) is in Appendix B of this document.

6.3 METHODS 24 AND 24A

Several commenters asked that the EPA clarify that Method 24, not Method 24A, is the test method that should be used to determine the VOC content of materials (inks, coatings, fountain solution additives and cleaning solvents) used by offset lithographic printers. We agree with this comment. The only situation for which the EPA has required or recommended that Method 24A be used is for publication rotogravure printing.

6.4 EMISSION LIMITATIONS AND MATERIAL TESTING

The emission limits recommended in the draft CTG or discussed in this document for fountain solution and cleaning materials are intended to limit the amount of VOC (or vapor pressure for cleaning materials) in these types of materials as they are used on the press (as applied). They were not intended to be limit the amount of VOC (or vapor pressure for cleaning materials) in the concentrates (as supplied) that are shipped from the supplier or distributor to the printer. Fountain solution concentrates, especially alcohol substitutes, are diluted with large amounts of water (e.g., a few ounces of concentrate per gallon of water) to make press ready fountain solution. Some cleaning materials may also be diluted with water before use on the press.

The amount of VOC in a press ready fountain solution or material can be determined directly by analysis of the press ready material, or from analytical data for the constituents of the press ready material combined in the proportions in which they are mixed to make press ready material. The analysis of the

constituents of the press ready material can be performed by the supplier of each constituent and provided to the printer. The principles discussed in the EPA document Procedures for Certifying Quantity of Volatile Organic Compounds Emitted by Paint, Ink and Other Coatings (EPA-450/3-84-019 as revised June 19, 1986) may be helpful to suppliers and printers in calculating "as applied" VOC contents from "as supplied" analytical VOC content data and mix ratios.

APPENDIX A

DEFINITION OF VOC COMPOSITE
PARTIAL VAPOR PRESSURE

FROM
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
RULE 1171

(35) VOC COMPOSITE PARTIAL PRESSURE is the sum of the partial pressures of the compounds defined as VOC's.

VOC Composite Partial Pressure is calculated as follows:

$$PP_c = \sum_{i=1}^n \frac{(W_i)(VP_i)/MW_i}{\frac{W_w}{MW_w} + \frac{W_e}{MW_e} + \sum_{i=1}^n \frac{W_i}{MW_i}}$$

Where:

W_i = Weight of the "i"th VOC compound, in grams

W_w = Weight of water, in grams

W_e = Weight of exempt compound, in grams

MW_i = Molecular weight of the "i"th VOC compound, in $\frac{\text{g}}{\text{g-mole}}$

MW_w = Molecular weight of water, in $\frac{\text{g}}{\text{g-mole}}$

MW_e = Molecular weight of exempt compound, in $\frac{\text{g}}{\text{g-mole}}$

PP_c = VOC composite partial pressure at 20°C, in mm Hg

VP_i = Vapor pressure of the "i"th VOC compound at 20°C, in mm Hg

APPENDIX B

OCTOBER 25, 1993 GUIDANCE
ON METHODS 25 AND 25A

October 25, 1993

MEMORANDUM

SUBJECT: EPA's VOC Test Methods 25 and 25A

FROM: John B. Rasnic, Director
Stationary Source Compliance Division
Office of Air Quality Planning and Standards

TO: Air, Pesticides, and Toxics Management Division
Directors
Regions I and IV

Air and Waste Management Division Director
Region II

Air, Radiation, and Toxics Division Director
Region III

Air and Radiation Division Director
Region V

Air, Pesticides, and Toxics Division Director
Region VI

Air and Toxics Division Directors
Regions VII, VIII, IX and X

As a result of requests from industry, Regional Offices and State programs, we have reviewed our guidance regarding the use of Methods 25 and 25A for measuring gas stream volatile organic compounds (VOC) concentration. Information obtained during this review has resulted in the following revised guidance, which is effective immediately and which supersedes all previous guidance on this matter. This revision has been coordinated with the other divisions within the Office of Air Quality Planning and Standards.

The EPA has decided to add an option 3 to permit further the use of Method 25A in lieu of Method 25 under certain conditions. Therefore, our new guidance is as follows. The EPA mandates the use of Method 25 for measuring gas stream VOC concentration when determining the destruction efficiency (DE) of afterburners. It

also allows the use of Method 25A, in lieu of Method 25, under any of the following circumstances: 1) when the applicable regulation limits the exhaust VOC concentration to less than 50 ppm; 2) when the VOC concentration at the inlet of the control system and the required level of control are such to result in exhaust VOC concentrations of 50 ppm or less; or 3) if, because of the high efficiency of the control device, the *anticipated* VOC concentration at the control system exhaust is 50 ppm or less, regardless of the inlet concentration.

Further, if a source elects to use Method 25A under option 3, above, the exhaust VOC concentration must be 50 ppm or less and the required DE must be met for the source to have demonstrated compliance. If the Method 25A test results show that the required DE apparently has been met, but the exhaust concentration is above 50 ppm, this is an indicator that Method 25A is not the appropriate test method and that Method 25A should be used.

BACKGROUND

The primary industry impacted by this policy is the printing industry, which has consistently claimed that the Method 25 test procedure is too expensive and cumbersome to be used as a compliance demonstration tool. They have stated that current state-of-the-art-technology afterburners routinely achieve 98-99 percent destruction efficiency, generally significantly greater than is required by regulations. As a result, control system outlet VOC concentrations are commonly less than 50 ppm, regardless of the inlet concentration.

Regulations which specify performance requirements for the subject control systems have typically been based on older technology, which was less efficient than current technology. We agree with the printing industry's claim that VOC destruction technology currently available can perform at greater levels than as specified by the regulations. It is therefore appropriate to revise our guidance on the usage of these compliance demonstration methods.

This guidance specifies the circumstances under which Method 25 and Method 25A are to be used. It will reduce the administrative burden on a significant number of regulated industrial sources but will not reduce the stringency of any currently applicable regulatory requirements.

cc: OAQPS Division Directors