

# **DRAFT**

**DRAFT CONTROL TECHNIQUES GUIDELINE FOR  
OFFSET LITHOGRAPHIC PRINTING  
AND  
LETTERPRESS PRINTING**

**JULY 2006**

**US EPA  
OAQPS  
RTP NC 27711**

TABLE OF CONTENTS

I. Introduction .....Page 3

II. Background and Overview .....Page 4

III. Applicability .....Page 5

IV. Process Description and Sources of VOC Emissions .....Page 7

    A. Offset Lithography

        1. Inks

        2. Fountain Solution

        3. Cleaning Materials

    B. Letterpress Printing

        1. Inks

        2. Cleaning Materials

V. Available Control Options .....Page 9

    A. Inks

    B. Fountain Solution

    C. Cleaning Materials

VI. Recommended Control Options .....Page 13

    A. Heatset web offset lithographic and heatset letterpress inks and dryers

    B. Fountain Solution

    C. Cleaning Materials

VII. Cost Effectiveness of Recommended Control Options .....Page 15

VIII. References .....Page 16

Appendix A

1993 Draft CTG for Offset Lithographic Printing and

1994 ACT for Offset Lithographic Printing .....Page 17

Appendix B

State and local regulations for offset lithographic printing .....Page 18

    Agency, Rule Number and Applicability

    Fountain Solution Limits

Appendix C

State and local regulations for letterpress printing .....Page 32

## **I. Introduction**

Clean Air Act (CAA) section 172(c)(1) provides that state implementation plans (SIPs) for nonattainment areas must include “reasonably available control measures” (RACM), including “reasonably available control technology” (RACT), for sources of emissions. Section 182(b)(2) provides that for certain nonattainment areas, States must revise their SIPs to include RACT for sources of VOC emissions covered by a control techniques guidelines (CTG) document issued after November 15, 1990 and prior to the area’s date of attainment.

The United States Environmental Protection Agency (EPA) defines RACT as “the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility.” 44 FR 53761 (Sept. 17, 1979). In subsequent Federal Register notices, EPA has addressed how states can meet the RACT requirements of the Act.

CAA section 183(e) directs EPA to list for regulation those categories of products that account for at least 80 percent of the VOC emissions, on a reactivity-adjusted basis, from consumer and commercial products in areas that violate the NAAQS for ozone (i.e., ozone nonattainment areas). EPA issued the list on March 23, 1995, and has revised the list periodically. *See* 60 FR 15264 (March 23, 1995); *see also* 71 FR 28320 (May 16, 2006), 70 FR 69759 (Nov. 17, 2005); 64 FR 13422 (Mar. 18, 1999). Offset lithographic printing and letterpress printing are included on the current section 183(e) list.

This draft CTG addresses both the offset lithographic printing industry and the letterpress printing industry. Although offset lithographic printing and letterpress printing are two distinct product categories on the section 183(e) list, they have many similarities in terms of the types of inks and cleaning materials used, the sources of VOC emissions, and the controls available to address those emissions. We therefore address both categories in this CTG.

This draft CTG is intended to provide state and local air pollution control authorities information that should assist them in determining RACT for volatile organic compounds (VOCs) for offset lithographic printing and letterpress printing. In developing this CTG, EPA, among other things, evaluated the sources of VOC emissions from these printing industries and the available control approaches for addressing these emissions, including the costs of such approaches. Based on available information and data, EPA provides recommendations for RACT for offset lithographic printing and letterpress printing. EPA solicits comment on all aspects of this draft document.

Once finalized, States can use the recommendations in this CTG to inform their own determination as to what constitutes RACT for VOCs for offset lithographic printing and letterpress printing in their particular nonattainment areas. The information contained in this document is provided only as guidance. This guidance does not change, or substitute for, applicable sections of the CAA or EPA’s regulations; nor is it a regulation itself. This document does not impose any legally binding requirements on any entity. It provides only recommendations for state and local air pollution control agencies to consider in determining

RACT. State and local pollution control agencies are free to implement other technically-sound approaches that are consistent with the CAA and EPA's implementing regulations

The recommendations contained in this draft CTG are based on data and information currently available to EPA. These general recommendations may not apply to a particular situation based upon the circumstances of a specific source. Regardless of whether a State chooses to implement the recommendations contained herein through State rules, or to issue State rules that adopt different approaches for RACT for VOCs for offset lithographic printing and letterpress printing, States must submit their RACT rules to EPA for review and approval as part of the SIP process. EPA will evaluate the rules and determine, through notice and comment rulemaking in the SIP process, whether they meet the RACT requirements of the Act and EPA's regulations. To the extent a State adopts any of the recommendations in this guidance into its State RACT rules, interested parties can raise questions and objections about the substance of this guidance and the appropriateness of the application of this guidance to a particular situation during the development of the State rules and EPA's SIP approval process.

CAA section 182(b)(2) provides that a CTG issued after November 15, 1990 and before the date of attainment must include the date by which States must submit SIP revisions in response to the CTG. States subject to section 182(b) should submit their SIP revisions within one year of the date of issuance of the final CTG for the offset lithographic printing and letterpress printing industries. States subject to CAA section 172(c)(1) may take action in response to this guidance, as necessary to attain.

## **II. Background and Overview**

On November 8, 1993, EPA published a draft CTG for offset lithographic printing. (58 FR 59261). After reviewing comments on the draft CTG and soliciting additional information to help clarify those comments, EPA published an alternative control techniques (ACT) document in June 1994 that provided supplemental information for States to use in developing rules based on RACT for offset lithographic printing. See References 1 and 2 in the reference section for the full citation to these documents.

The 1993 draft CTG and 1994 ACT are included as Appendix A to this draft CTG. These documents provide a thorough discussion of the offset lithographic printing industry, the nature of VOC emissions from that industry, available control technologies for addressing such emissions, the costs of available control options, and other items. In large part, the proposed recommended approaches for RACT in this document are similar to those proposed in 1993. EPA developed the recommended approaches contained in this document after reviewing existing state and local VOC emission reduction approaches, reviewing the 1993 draft CTG and 1994 ACT, and considering information obtained since issuance of the ACT.

As noted above, letterpress printing and offset lithographic printing have several important similarities, including similar sources of VOC emissions and similar available VOC control approaches. In light of these similarities, EPA relied heavily on the substantial data and information included in the 1993 draft CTG and 1994 ACT for offset lithographic printing

in formulating the recommendations for RACT in this document for the letterpress printing industry.

The remainder of this document is divided into six sections. The first section describes the scope of sources to which this CTG applies. The second section provides a summary of the processes associated with the offset lithographic and letterpress printing industries and identifies the sources of VOC emissions from those processes. The third section describes the available control approaches for addressing VOC emissions and summarizes state and local regulatory approaches for addressing such emissions. Appendices B and C to this document contain tables that identifies the state and local regulatory approaches that EPA reviewed in preparing this draft document. The fourth section provides our proposed recommendations for RACT for offset lithographic printing and letterpress printing. The fifth section discusses the cost-effectiveness of the recommended control approaches. The final section contains a list of references.

In the 1993 draft CTG, we provided an example of a rule that incorporated the recommendations contained in that draft CTG. The example rule provided a general organizational framework for States to use in developing their own state rules implementing RACT for offset lithographic printers. The example rule also contained sample regulatory language. We provided this example in 1993, recognizing that each state and local pollution control agency will establish its own rules for RACT considering available information, including specific information about the sources to which the rule will apply. We are considering including a similar example rule when we finalize this draft CTG, and such example rule would incorporate the recommendations contained in the final CTG. We are still evaluating, however, the utility of such a rule, in light of our prior model rule and the state rules that address the product categories at issue here. See Appendices B and C (identifying state and local regulations that require controls for VOC emissions from offset lithographic printing and letterpress printing operations). We solicit comment on whether a model rule that incorporates the recommendations contained in the final CTG would be useful.

### **III. Applicability**

This draft CTG applies to offset lithographic printing operations and letterpress printing operations that emit at least 6.8 kg/day (15 lb/day) of VOC before consideration of controls.<sup>1</sup> The 15 lb VOC per day level is consistent with the applicability threshold

---

<sup>1</sup> Lithographic printing” means a printing process where the image and non-image areas are chemically differentiated; the image area is oil receptive and the non-image area is water receptive. This method differs from other printing methods, where the image is a raised or recessed surface. “Offset lithographic printing” means a printing process that transfers the ink film from the lithographic plate to an intermediary surface (blanket), which, in turn, transfers the ink film to the substrate. “Letterpress printing” means a printing process in which the image area is raised relative to the non-image area and the paste ink is transferred to the substrate directly from the image surface.

contained in many previous CTGs.<sup>2</sup> It is also consistent with the purpose of the section 183(e) program. In section 183(e), Congress directed EPA to assist States in achieving VOC emission reductions from consumer and commercial products. These products individually may result in relatively small amounts of VOC emissions, but, in the aggregate, they contribute significantly to ozone formation in nonattainment areas. Given the nature of the products and sources at issue here, we believe that the 15 lb VOC per day applicability threshold is appropriate.

For purposes of determining whether the 15 lb/day applicability threshold is met at a given facility, an offset lithographic printer should consider emissions from all offset lithographic printing and related cleaning activities at the facility prior to controls. Similarly, a letterpress printer should consider emissions from all letterpress printing and cleaning operations at a facility prior to controls, in evaluating whether the 15 lb/day threshold has been met.

The only exception to the 15 VOC per day threshold relates to the add-on control recommendations provided below for heatset web offset lithographic printing operations and heatset web letterpress printing operations. Specifically, the add-on control recommendations for heatset web offset lithographic printing operations and heatset web letterpress printing operations apply only to those facilities with potential to emit from the dryers, prior to controls, of at least 25 tpy of VOC combined from heatset inks and carryover of VOC from other materials.<sup>3</sup> We are recommending the higher 25 tpy threshold for add-on controls at heatset web offset lithographic printing operations and heatset web letterpress printing operations because our limited information suggests that add-on controls for small printers may be more costly for a given amount of emission reduction.

We estimate that there are approximately 6,700 offset lithographic printing facilities in current ozone nonattainment areas that meet the 15 lb of VOC per day applicability threshold. We derived this number based on available information concerning the offset lithographic printing industry. Specifically, in the 1993 draft CTG, we estimated that, as of the early 1990s, there were approximately 34,500 offset lithographic printing facilities in ozone nonattainment areas. We have information concerning the percentage of the U.S. population residing in nonattainment areas in the 1990 and 2000. We believe it is reasonable to use these population figures to estimate the number of offset lithographic printing facilities in current nonattainment areas (i.e., areas based on the April 2006 designations). Specifically, given the percentage of U.S. population in ozone nonattainment areas in 1993, and the

---

<sup>2</sup> - See, e.g., *Model Volatile Organic Compound Rules for Reasonably Available Control Technology: Planning for Ozone Nonattainment Pursuant to Title I of the Clean Air Act*, dated June 1992 (establishing the 15 lb of VOC per day applicability threshold for coating applications for eleven industries, including, automobile and light duty truck coating operations and coating of cans, coil, paper, fabric, vinyl, metal furniture, large appliances, magnet wire, miscellaneous metal parts, and flatwood paneling).

<sup>3</sup> As explained below, for offset lithographic printers, "other materials" means alcohol substitutes (fountain solution) and low vapor pressure automatic blanket wash materials. For letterpress printers, "other materials" means automatically applied low vapor pressure cleaning materials.

percentage of U.S. population in ozone nonattainment areas today, we estimate that 30,500 offset lithographic printing facilities are located in current ozone nonattainment areas. In the 1993 draft CTG, 78 percent of the facilities emitted less than 15 lb/day before controls. See Appendix A for additional information. We do not have any information that would lead us to believe that this figure has changed since 1993. Applying this percentage to the number of offset lithographic printing facilities in current ozone nonattainment areas, about 6,700 facilities emit 15 lb VOC per day or more.

We have limited information on the number of letterpress printing facilities in ozone nonattainment areas. In 1992, however, EPA's Office of Pollution Prevention and Toxics issued a report,<sup>3</sup> which estimates that there are 21,000 facilities nationwide that are engaged in letterpress printing operations. Based on the percentage of the U.S. population in ozone nonattainment areas in 1990 and the percentage of U.S. population in ozone nonattainment areas in 2000), we estimate that approximately 11,000 of these facilities are located in current ozone nonattainment areas (based on April 2006 designations). In light of the similarities between letterpress and offset lithographic printing and the lack of specific data relevant to letterpress printers, we assume that approximately 80 percent of the letterpress facilities in current ozone nonattainment areas emit less than 15 lb of VOC per day and would therefore not be affected by this CTG. Applying this percentage to the number of letterpress printing facilities in current ozone nonattainment areas, about 2,200 facilities emit 15 lb VOC per day or more.

#### **IV. Process Description and Sources of VOC Emissions**

##### **A. Offset Lithography**

Offset lithography is a planographic method of printing. The term "planographic" denotes that the printing and non-printing areas are in the same plane on the surface of a thin metal lithographic plate. To maintain the distinction between the areas on the lithographic plate, the image area is rendered oil receptive, and the non-image area is rendered water receptive.

Offset lithography is an indirect printing method; that is, ink is not transferred directly to a substrate. Rather, ink is transferred from the lithographic plate to a rubber-covered, intermediate "blanket" cylinder and then transferred from the blanket cylinder to the substrate. The offset lithographic process is used for a broad range of printing applications, including books, magazines, periodicals, labels and wrappers, catalogs and directories, financial and legal documents, business forms, advertising brochures, newspapers, newspaper inserts, charts and maps, calendars, tickets and coupons, greeting cards, and stamps.

There are two types of offset lithography characterized by the method in which the substrate is fed to the press. In sheet-fed printing, individual sheets of paper or other substrate are fed to the press. In web printing, continuous rolls of substrate material are fed to the press and rewound or cut to size after printing. VOC emissions from offset lithographic printing result from evaporation of components of the inks, fountain solutions, and cleaning materials. For a fuller description of these industry processes, refer to Appendix A,

## 1. *Inks*

Offset lithographic printing inks are composed of pigments, vehicles, binders, and other additives. Offset lithographic inks are paste inks. Pigments provide the desired color and contain organic and inorganic materials. The vehicle is a solvent that carries pigment and binders, and is usually composed of petroleum oils and vegetable oils. Binders fix the pigment to the substrate and are composed of organic resins and polymers or oils and resins. Additives include waxes, lubricants, and driers.

Heatset web inks require heat to set the ink. Coldset web (also called non-heatset web) and sheet-fed inks dry by absorption into the substrate or by oxidation. Some radiation (ultra-violet light and electron beam) cured materials are also used.

Heatset web inks may contain up to 45 percent VOCs (ink oils). In heatset web lithographic printing, 20 percent of the petroleum ink oils and essentially all of the vegetable ink oils are retained in the substrate and dry ink film. The remaining 80 percent of the petroleum ink oil is volatilized in and then exhausted from the dryer. Since the vegetable ink oil does not volatilize in the dryer, the amount of vegetable ink oil that can be used in heatset web offset lithographic inks is very limited. If there is too much vegetable oil in a heatset web offset lithographic ink, the ink will not dry properly.

The petroleum ink oils in sheet-fed and coldset web inks have higher boiling points than the ink oils in heatset inks. Coldset web inks usually contain below 35 percent VOC. Most sheet-fed inks contain below 25 percent VOC. In sheet-fed and coldset web offset lithographic printing, 95 percent of the petroleum ink oils and essentially all of the vegetable oils are retained in the substrate and dry ink film. The remaining 5 percent of petroleum ink oils is volatilized and emitted. Because of the high level of ink oil retention, emissions from sheet-fed and coldset web offset lithographic inks are inherently very low.

## 2. *Fountain Solution*

Fountain solution is applied to the lithographic plate to render the non-image areas unreceptive to ink. Since offset lithographic printing inks are oil-based, the fountain solution is water-based. The fountain solution contains small amounts of gum Arabic or synthetic resins, acids, and buffer salts to maintain the pH of the solution, and a wetting agent or "dampening aid" to enhance the spreadability of the fountain solution across the plate. The dampening aid reduces the surface tension of water as well as increases viscosity.

Isopropyl alcohol traditionally has been used as a dampening aid. Other alcohols such as ethanol and n-propyl alcohol may also be used. Before the 1980's, the concentration of alcohol in the fountain solution was sometimes as high as 35 percent, with the concentration in most presses falling between 15 and 20 percent. Over the last 20 years, printers have greatly reduced the alcohol content of fountain solution. Also in the last 20 years, non-alcohol dampening aids have been developed. These alcohol substitutes are typically glycol ethers or ethylene glycol, and achieve the same purpose as alcohol.

### *3. Cleaning Materials*

Cleaning materials are used to remove excess printing inks, oils, and residual paper from press equipment. These materials are typically mixtures of organic (often petroleum-based) solvents. The cleaning material may be a solvent such as kerosene (which contains numerous organics), or a specific mixture of individual solvents. Cleaning materials are used to wash the blankets, rollers, and outside of presses, and to remove residues of excess ink between color changes. Cleaning may be done manually, for example using shop towels, or using an automatic blanket wash systems.

#### **B. Letterpress Printing**

##### *3. Inks*

Letterpress inks are similar to offset lithographic inks. They are paste inks containing petroleum oils or vegetable oils. Both sheet-fed and web presses are used for letterpress printing.

Sheet-fed letterpress presses use coldset inks. Most web letterpress equipment use coldset inks. These letterpress inks are similar in composition and behavior to sheet-fed and coldset web lithographic inks. In sheet-fed and coldset web letterpress printing, 95 percent of the petroleum ink oils and essentially all of the vegetable oils are retained in the substrate and dry ink film. The remaining 5 percent of petroleum ink oils is volatilized and emitted. Because of the high level of ink oil retention, emissions from sheet-fed and coldset web letterpress inks are inherently very low.

There are also some heatset web letterpress printers. Heatset letterpress ink is similar to heatset lithographic ink with 20 percent of the petroleum ink oils and essentially all of the vegetable ink oils retained in the substrate and dry ink film. The remaining 80 percent ink oil is volatilized in and then exhausted from the dryer. Since the vegetable ink oil does not volatilize in the dryer, the amount of vegetable ink oil that can be used in heatset letterpress inks is very limited. If there is too much vegetable oil in a heatset letterpress ink, the ink will not dry properly.

### *4. Cleaning Materials*

Cleaning materials are used to remove excess printing inks, oils, and residual paper from press equipment. The cleaning materials used for letterpress printing are similar to those used in offset lithographic printing. These materials are typically mixtures of organic (often petroleum-based) solvents.

#### **V. Available Control Options**

There are three main sources of VOC emissions from offset lithographic printing: (1) evaporation of VOC (petroleum ink oils) from the inks; (2) evaporation of VOC from the

fountain solution; and (3) evaporation of VOC from the cleaning materials. There are two main sources of VOC emissions from letterpress printing: (1) evaporation of VOC (petroleum ink oils) from the inks and (2) evaporation of VOC from the cleaning materials.

The three mechanisms to reduce VOC emissions from offset lithographic printing and letterpress printing are as follows:

- Add-on controls,
- Process modifications or work practices, and
- Material reformulation or substitution.

A. Inks

Inks are a significant source of VOC emissions from heatset web offset lithographic printing and heatset letterpress printing. In these processes, heat is applied in a dryer to set the inks. As a result of the heating process, about 80 percent of the petroleum ink oil (VOC) is volatilized in the dryer. The remaining 20 percent of petroleum ink oil and all of the vegetable ink oil is retained in the substrate and dry ink film.

Most heatset web offset lithographic printing dryers are equipped with control devices such as a thermal oxidizer, catalytic oxidizer, or chiller condenser (condenser filter). These same control devices can also be used on heatset letterpress dryers. These control devices significantly reduce VOC emissions from heatset web printing. Oxidizers are more widely used than condenser filters, with catalytic oxidizers being slightly more popular than thermal oxidizers. At the time the 1993 draft CTG was being developed, new oxidizers generally were capable of achieving 95 percent or greater destruction efficiency, but chiller condensers were only capable of achieving 90 percent.

Oxidizers and condenser filters may not be able to achieve the above stated destruction or recovery efficiencies when the VOC concentration of the stream entering the control device is too low. Oxidizers tend to have a rather constant outlet concentration around 20 ppmv as compound. As a result, an oxidizer that achieves 90 percent destruction efficiency at inlet concentrations above 200 ppmv as compound may not be able to achieve this level of destruction efficiency at inlet concentrations below 200 ppmv as compound. Similarly, an oxidizer that achieves 95 percent destruction efficiency at inlet concentrations above 400 ppmv as compound may not be able to achieve this level of destruction efficiency at inlet concentrations below 400 ppmv as compound. Print jobs (e.g., book printing) with light coverage will yield low inlet concentrations. In addition, there are several instances, such as sources utilizing combined dryers and control devices that do not have an identifiable measurable inlet where the only option available is to measure the outlet concentration to demonstrate compliance.

Some reduction in VOC emissions from heatset web offset lithographic inks and heatset letterpress inks could be achieved by increasing the use of vegetable oil and decreasing the use of petroleum oil. Since only very limited amounts of vegetable oil can be used in

heatset inks, only a small emission reduction could be achieved and we do not believe this reduction would be cost-effective.

The VOC emissions from sheet-fed and coldest web lithographic inks and sheet-fed and coldset web letterpress inks are inherently very low. First, these inks are lower VOC-content inks than heatset web inks. Second, 95 percent of the petroleum ink oil and essentially all of the vegetable ink oil in sheet-fed and coldset web inks do not evaporate and are retained in the substrate and dry ink film. Because only a small percentage of the sheet-fed and coldest web ink oils evaporate, VOC emissions associated with these inks are small.

Some reduction in VOC emissions from sheet-fed and coldset web inks could be achieved by increasing the use of vegetable oil and decreasing the use of petroleum oil. Since 95 percent of the petroleum oil is retained, only a small emission reduction could be achieved and we do not believe this reduction would be cost-effective.

The limited VOC emissions that occur from sheet-fed and coldset web offset lithographic inks are diffuse and spread over a large area. These emissions are not amenable to add-on control. This is in contrast to the emissions associated with heatset offset web lithographic inks and heatset web letterpress inks, as the petroleum oils in those inks volatilize in a dryer and are more amenable to add-on control because they are emitted in a more concentrated form from a discrete source.

#### **B. Fountain Solution**

Fountain solutions can be the source of a significant portion of the VOC emitted by offset lithographic printing operations. Historically, alcohols such as isopropyl alcohol, n-propyl alcohol and ethanol were used as the dampening aid.

Before the 1980's, the concentration of alcohol in the fountain solution was sometimes as high as 35 percent, with the concentration in most presses falling between 15 and 20 percent. Over the last 20 years, printers have greatly reduced the alcohol content of fountain solution.

Cooling a fountain solution that contains isopropyl alcohol is a process modification that reduces VOC emissions by reducing the evaporation of the alcohol. Refrigerated circulators are available that can cool the fountain solution to a pre-set temperature of 55 to 60 °F. Refrigeration also gives operators better control of ink emulsification and hot weather scumming, and stabilizes the ink/water balance by minimizing alcohol evaporation. Refrigeration of fountain solution trays has been shown to reduce alcohol consumption by as much as 44 percent.

In addition, many printers have reduced VOC emissions by switching to alcohol substitutes, most commonly certain glycol ethers. These additives have higher boiling points and lower volatilities than traditional dampening aids. The additives are incorporated in small quantities (from 2 to 4 ounces in 1 gallon of water) to produce a final, mixed fountain solution that is usually less than 3 weight percent VOC.

C. Cleaning Materials

Cleaning materials can be the source of a significant portion of the VOC emitted by offset lithographic printing and letterpress printing operations. The keys to reducing VOC emissions from letterpress printing cleaning materials are reducing the composite vapor pressure of the material used and work practices.

Cleaning materials with composite vapor pressure less than 10 millimeters of mercury (mm Hg) at 20 °C have been used successfully by many printers for blanket washing and other cleaning activities. These low vapor pressure materials generate less VOC emissions than higher vapor pressure cleaning materials. For certain difficult cleaning activities, such as removing dried ink, higher vapor pressure cleaning materials may be required.

Work practices such as keeping solvent containers closed except when filling, draining or conducting cleaning operations, and keeping used shop towels in closed containers also reduce VOC emissions. Typically, 50 percent of a cleaning material with composite vapor pressure less than 10 mm Hg at 20 °C will remain in used shop towels if the used towels are kept in closed containers.

Water-miscible cleaning materials with less than 30 weight percent VOC were developed and tested for offset lithographic printing in the early 1990's. These materials were recommended as RACT in the 1993 draft CTG. These materials did not provide adequate performance and therefore they are not being used by the offset lithographic printing industry today. Instead, cleaning materials with composite vapor pressure less than 10 mm Hg at 20 °C are commonly used today. As noted in the ACT document, these low composite vapor pressure cleaning materials when used in conjunction with good work practices achieve a comparable emission reduction to cleaning materials containing 30 weight percent VOC.

There are some water-miscible cleaning materials that contain around 70 weight percent VOC in use today. We do not believe that cleaning materials containing 70 weight percent VOC can achieve as much emission reduction as cleaning materials with composite vapor pressure of 10 mm Hg at 20 °C.

In researching available control approaches for addressing VOC emissions associated with offset lithographic printing and letterpress printing, EPA reviewed existing state and local regulatory approaches. Seventeen states or local areas have VOC emission regulations for offset lithographic printing operations. Five states or local areas have regulations for letterpress printing operations. These rules generally limit the alcohol or alcohol substitute content of fountain solutions (for offset lithographic printers only) and the composite vapor pressure of cleaning materials, and require control of heatset dryer exhaust. The table in Appendices B and C list the regulations that EPA reviewed and describes their applicability.

## **VI. Recommended Control Options**

Recommendations for controlling emissions of VOC from heatset inks, fountain solution, and cleaning solutions used in offset lithographic printing operations are as follows:

### **A. Heatset web offset lithographic and heatset letterpress inks and dryers**

The recommended level of control for VOC emissions from exhaust from dryers used to set heatset inks is a 90 percent reduction in VOC for control equipment first installed before March 14, 1995. This level of control can be achieved by thermal oxidizers, catalytic oxidizers and condenser filters available before that date. This level of control was recommended in the 1993 draft CTG and is required by most existing state and local regulations.

Oxidizers first installed on or after March 14, 1995, can achieve 95 percent efficiency. We recommend control equipment first installed on or after March 14, 1995, be required to achieve 95 percent efficiency.

As an alternative, we also recommend providing an option to reduce the control device outlet concentration to 20 ppmv as hexane on a dry basis to accommodate situations where the inlet VOC concentration is low, or there is no identifiable measurable inlet.

The above recommended levels of control apply only to heatset web offset lithographic printing operations with potential to emit from the dryers, prior to controls, of at least 25 tpy of VOC combined from heatset inks and carryover of alcohol substitutes (fountain solution) and low vapor pressure automatic blanket wash materials. The above recommended levels of control also apply only to heatset web letterpress printing operations with potential to emit from the dryers, prior to controls, of at least 25 tpy of VOC combined from heatset inks and carryover of automatically applied low vapor pressure cleaning materials. We are recommending these thresholds for add-on controls for heatset ink printers because the limited information currently available to us suggests that controls for small printers may be more costly for a given amount of emission reduction. In the 1993 draft CTG, EPA examined the cost of controlling heatset dryer emissions from four different size model plants. Annual ink oil emissions, before control, from the dryers at these facilities were approximately 25, 50, 100 and 200 tons per year. The cost-effectiveness of controlling these ink oil emissions was estimated to range from \$1,300 per ton at the largest model facility to \$2,300 per ton at the smallest model facility (1990 dollars). In 2005 dollars, this equates to \$1,800 per ton at the largest model facility and \$3,100 per ton at the smallest model facility. More recently, EPA learned of a heatset web offset lithographic book printing facility with potential to emit 26 tpy of VOC from ink and alcohol substitute (fountain solution) carryover before control from the dryers on five heatset web offset lithographic presses. Book printing tends to have much lighter coverage and lower dryer exhaust VOC concentration than other types of heatset printing (e.g., magazine printing). In this case the VOC concentration of the dryer exhaust was very low. A 2004 state BACT analysis for this facility did not require the installation of control equipment. The cost per ton of controlling heatset dryer emissions was estimated by

the facility to be \$15,500 per ton which is significantly higher than that estimated for the smallest model facility in the 1993 draft CTG.

We recognize that we have limited information on small heatset web facilities and the costs of controlling VOCs emitted from the dryers at these smaller sources. To allow us to assess the cost of controlling dryer emissions at small heatset web facilities and the appropriateness of the 25 tpy threshold for controlling dryer exhaust from heatset web printers, we request information on the mass of ink oil emissions and mass of alcohol substitute and automatic blanket wash carryover before control (for offset lithographic printers), the mass of ink oil emissions and mass of automatically applied low vapor pressure cleaning materials. carryover before control (for letterpress printers),, dryer exhaust rates, and other relevant operating parameters for facilities with potential to emit from heatset dryers up to 100 tpy. We would also welcome information on the experience of smaller facilities in controlling their dryer emissions, including any alternative control approaches, and the cost of such controls.

**B. Fountain Solution**

We recommend the following approaches for controlling VOC emissions from fountain solution. These recommended levels of control were recommended in the 1993 draft CTG and are required by certain existing state and local regulations.

- **Heatset Web Offset Lithographic Printing**  
The recommended level of control for VOC emissions from fountain solution for heatset web offset lithographic printing is 1.6 percent alcohol (by weight) in the fountain or equivalent. There are at least three different approaches for achieving this level of control. The first approach involves reducing the alcohol content to 1.6 percent alcohol or less (by weight). The second approach involves using 3 percent alcohol or less (by weight) in the fountain solution if the fountain solution is refrigerated to below 60°F (15.5°C). The third approach involves using 5 percent alcohol substitute or less (by weight) and no alcohol in the fountain solution.
- **Sheet-fed Offset Lithographic Printing**  
The recommended level of control for VOC emissions from fountain solution for sheet-fed printing is equivalent to 5 percent alcohol (by weight) in the fountain or equivalent. There are at least three different approaches for achieving this recommended level of control. The first approach involves reducing the alcohol content to 5.0 percent alcohol or less (by weight). The second approach involves using 8.5 percent alcohol or less (by weight) in the fountain solution provided the fountain solution is refrigerated to below 60°F (15.5 °C). The third approach involves using 5 percent alcohol substitute or less (by weight) and no alcohol in the fountain solution.
- **Coldset Web Offset Lithographic Printing**

The recommended level of control for VOC emissions from fountain solution for coldset web is 5 percent alcohol substitute or less (by weight) and no alcohol in the fountain solution.

C. Cleaning Materials

We recommend using cleaning materials with a VOC composite vapor pressure less than 10 mm Hg at 20 °C. We also recommend that the following work practices be employed: keeping cleaning materials and used shop towels in closed containers. In the ACT document, EPA noted that using cleaning materials with a VOC composite partial vapor pressure less than 10 mm Hg at 20 °C in conjunction with good work practices would result in an emission reduction that is comparable to using cleaning materials that contain less than 30 weight percent VOC.

We also recommend an allowance for limited, for example 209 or 418 liters (55 or 110 gallons) per year, use of higher vapor pressure cleaning materials. We request comments on the appropriate size for this allowance and additional information on the specific cleaning activities which require the use of higher vapor pressure cleaning materials.

**VII. Cost Effectiveness of Recommended Control Options**

In the 1993 draft CTG, EPA estimated the baseline VOC emissions associated with offset lithographic printing facilities. EPA also conducted a model plant analysis, in which it evaluated VOC emissions associated with different kinds of printing processes, the VOC emission reduction capabilities of various control options, and the costs of such controls. The model plants were developed to represent a range of sizes and emissions. The model plant analysis and EPA's VOC emission reduction and cost estimates are discussed, in full, in Appendix A (see 1993 draft CTG and 1994 ACT).

In the 1993 draft CTG, EPA estimated baseline emissions from the offset lithographic printing industry in ozone nonattainment areas, based on 1990 data, to be 820,000 tons per year (with 62,000 tpy coming from ink, 631,000 tpy from fountain solution and 126,000 tpy from cleaning). Commenters on the 1993 draft CTG asserted that the alcohol content (17 percent) used to generate this estimate was too high and that the assumed ratio of fountain solution usage to ink usage was also too high. Baseline VOC emissions from fountain solution may have been overestimated in 1993 by a factor of 2 to 3, which would mean that industrywide baseline emissions in 1990 ranged from approximately 400,000 to 500,000 tpy. As for letterpress printers, we have limited emissions information for this industry. Based on available information, we estimate that VOC emissions from the letterpress printing industry as of 1990 were about 28,000 tons per year.

We believe that the model plant analysis in the 1993 draft CTG is representative of current operations in the offset lithographic printing industry and current control options. The significant control approaches addressed in the 1993 draft CTG are the same approaches that are available today, and those approaches continue to represent the most effective means of controlling VOC emissions from offset lithographic printers. We also believe that the

model plant analysis accurately presents the costs associated with the control approaches identified in the 1993 document. We recognize, however, that the costs in that draft document are presented in first quarter 1990 dollars and must be adjusted to represent current costs. Accordingly, for purposes of estimating the cost-effectiveness of the recommended control approaches in this document, we escalated the 1990 costs in the 1993 draft CTG, to 2005 costs using a cost index.<sup>4</sup> The escalated costs are presented in Table 1 below.

**Table 1. Cost Effectiveness Values for Recommended Control Approaches for Offset Lithographic Printing**

<b>Control Technique</b>	<b>\$ Per Ton VOC Removed<sup>a</sup></b>
Control of VOC from heatset inks	2,010
Control of VOC from fountain solutions	estimated savings <sup>b</sup>
Control of VOC from cleaning materials	855

<sup>a</sup> Costs from 1990 are escalated to 2005 costs by use of a Marshall and Swift Equipment Cost Index (Chemical Engineering Magazine).

<sup>b</sup> Reduction in alcohol use or conversion to alcohol substitutes results in a cost savings.

Because of the similarities between offset lithographic printing and letterpress printing in terms of the nature of the processes at issue, the sources of VOC emissions and available control approaches, it is reasonable to assume that the cost-effectiveness estimates in Table 1 for control of VOC from heatset inks and control of VOC from cleaning materials apply equally to the letterpress printing industry.

### **VIII. References**

1. Guideline Series: Control of Volatile Organic Compound Emissions from Offset Lithographic Printing. Draft. U.S. Environmental Protection Agency. Research Triangle Park, NC. September 1993.
2. Alternative Control Techniques Document: Offset Lithographic Printing. EPA 453/R-94-054. U.S. Environmental Protection Agency. Research Triangle Park, NC. June 1994.
3. Use Cluster Analysis of the Printing Industry. Office of Pollution Prevention and Toxics. Office of Pollution Prevention and Toxics. May 1992.
4. Marshall and Swift Equipment Cost Index. Chemical Engineering Magazine. McGraw-Hill. ([www.che.com](http://www.che.com))
5. Model Volatile Organic Compound Rules for Reasonably Available Control Technology: Planning for Ozone Nonattainment Pursuant to Title I of the Clean Air Act. U.S. Environmental Protection Agency. Research Triangle Park, NC. June 1992.

## **Appendix A**

Guideline Series: Control of Volatile Organic Compound Emissions from Offset Lithographic Printing. Draft. U.S. Environmental Protection Agency. Research Triangle Park, NC. September 1993.

Available as a separate item in docket EPA-HQ-OAR-2006-0536  
and on the internet at <http://www.epa.gov/ttn/atw/print/draftlithoctg.pdf> .

Alternative Control Techniques Document: Offset Lithographic Printing.  
EPA 453/R-94-054. U.S. Environmental Protection Agency. Research Triangle Park,  
NC. June 1994.

Available as a separate item in docket EPA-HQ-OAR-2006-0536  
and on the internet at <http://www.epa.gov/ttn/atw/print/lact.pdf> .

Appendix B

State and Local Rules for Offset Lithographic Printing  
Agency, Rule Number and Applicability

State or Local Agency	Offset Lithography	Applicability
Bay Area Air Quality Management District	Regulation 8  Rule 20	<a href="http://www.baaqmd.gov/dst/regulations/rg0820.pdf">http://www.baaqmd.gov/dst/regulations/rg0820.pdf</a>  8-20-110  175 lb VOC per month
San Joaquin Valley Unified Air Pollution Control District	Rule 4607 -  Graphic Arts	No cutoff  <a href="http://www.valleyair.org/rules/currnrules/r4607.pdf">http://www.valleyair.org/rules/currnrules/r4607.pdf</a>  2.0 Applicability This rule is applicable to any graphic arts printing operation, to any paper or fabric coating operation, to the organic solvent cleaning, and to the storage and disposal of solvents and waste solvent materials associated with such operations as defined in Section 3.0 of this rule.
San Diego County Air Pollution Control District	Rule 67.16 -  Graphic Arts  Operations	<a href="http://www.sdapcd.org/rules/rules/Reg4pdf/R67-16.pdf">http://www.sdapcd.org/rules/rules/Reg4pdf/R67-16.pdf</a>  (1) The provisions of Sections (d) and (e) of this rule shall not apply to stationary sources which emit less than an average of 15 lbs (6.8 kg) of volatile organic compounds (VOCs) from all graphic arts operations per day of operation for each calendar month.

**DRAFT CTG for Offset Lithographic Printing and Letterpress Printing**  
**Docket No. EPA-HQ-OAR-2006-0536**

<p>South Coast Air Quality Management District</p>	<p>Rule 1130 - Graphic Arts, Rule 1171 - Solvent Cleaning Operations</p>	<p><a href="http://www.aqmd.gov/rules/reg/reg11/r1130.pdf">http://www.aqmd.gov/rules/reg/reg11/r1130.pdf</a>  no cutoff</p>
<p>Delaware</p>	<p>CAP 24.47 - Offset Lithographic Printing</p>	<p><a href="http://www.dnrec.state.de.us/air/aqm_page/docs/pdf/reg_24.pdf">http://www.dnrec.state.de.us/air/aqm_page/docs/pdf/reg_24.pdf</a>  15 lb/day  2. This Section does not apply to any offset lithographic printing facility whose total actual volatile organic compound (VOC) emissions from all lithographic printing operations (including emissions from cleaning solutions used on lithographic printing presses) are less than 6.8 kilograms (kg) (15 pounds [lb]) VOCs per day before the application of capture systems and control devices.  or maintains a maximum dryer exhaust outlet concentration of 20 parts per million by volume (ppmv) as methane (as C1), whichever is less stringent when the press is in operation.</p>
<p>Georgia</p>	<p>391-3-1-02 Provisions. Amended, (2) (ddd) - VOC Emissions from Offset Lithography</p>	<p>25 tpy  100 tpy  3. The requirements of this subsection shall apply to facilities with VOC emissions exceeding 25 tons per year and located in the counties of Cherokee, Clayton, Cobb, Coweta, DeKalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding and Rockdale and to facilities with potential VOC emissions exceeding 100 tons per year and located in the counties of Bartow, Carroll, Hall, Newton, Spalding, and Walton.</p>
<p>Illinois</p>	<p>35.215.408 - (Heatset Web),</p>	<p>Old rule? <a href="http://www.ipcb.state.il.us/documents/dsweb/Get/Document-11924/">http://www.ipcb.state.il.us/documents/dsweb/Get/Document-11924/</a>  Section 215.408 Heatset Web Offset Lithographic Printing a) No owner or operator of a heatset web offset lithographic printing facility, located in Cook, DuPage, Kane,</p>

**DRAFT CTG for Offset Lithographic Printing and Letterpress Printing**  
**Docket No. EPA-HQ-OAR-2006-0536**

	<p>35.218.407 -          Lines on and          after March          15, 1996, and          35.219.407 -          Lines on and          after March          15, 1996</p>	<p>Lake, Macoupin, Madison, McHenry, Monroe, St. Clair or Will County, emitting over 100 tons/year of organic material, in the absence of pollution control equipment, may cause or allow the operation of a heatset web offset press unless:</p> <p>1) An incinerator system is installed and operated that oxidizes at least 90 percent of the organic materials (measured as total combustible carbon) in the dryer exhaust airstream to carbon dioxide and water; or</p> <p>2) The fountain solution contains no more than eight (8) percent, by weight, of volatile organic material and a condensation recovery system is installed and operated that removes at least 75 percent of the non-isopropyl alcohol organic materials from the dryer exhaust airstream.</p> <p>b) No owner or operator of a heatset web offset lithographic printing facility, located in a county other than Cook, DuPage, Kane, Lake, Macoupin, Madison, McHenry, Monroe, St. Clair or Will County, emitting over 100 tons/year of organic material, in the absence of pollution control equipment, may cause or allow the operation of a heatset web offset press unless the fountain solution contains no more than eight (8) percent, by weight, of volatile organic material.</p> <p>(Source: Added at 11 Ill. Reg. 16706, effective September 30, 1987)</p>
<p>Kansas</p>	<p>28-19-76 -          Lithography          Printing          Operations</p>	<p><a href="http://www.kdheks.gov/bar/download/AIRREGS2005new.pdf">http://www.kdheks.gov/bar/download/AIRREGS2005new.pdf</a></p> <p><b>28-19-76. Lithography printing operations.</b> (a) The provisions of this regulation shall apply to all offset lithography printing facilities with a potential contaminant emission rate of volatile organic compounds (VOC) equal to or more than 100 tons per year. The potential contaminant emission rate calculations may include federally enforceable permit conditions.</p> <p>(b) The provisions of this regulation do not apply to:</p> <p>(1) printing on fabric, metal or plastic;</p> <p>(2) sheet fed lithographic presses with cylinder widths of 26 inches or less; or</p> <p>(3) web lithographic presses with cylinder widths of 18 inches or less.</p> <p>(c) Any owner or operator of an offset lithographic printing press subject to this regulation</p>
<p>Maryland</p>	<p>26.11.19.11 -          Lithographic          Printing</p>	<p><a href="http://www.dsd.state.md.us/comar/26/26.11.19.11.htm">http://www.dsd.state.md.us/comar/26/26.11.19.11.htm</a></p> <p>no cutoff for some items, 100 lb/day from web presses for heatset dryer control, 18 inch width for sheet fed ftn soln limits</p>

**DRAFT CTG for Offset Lithographic Printing and Letterpress Printing**  
**Docket No. EPA-HQ-OAR-2006-0536**

<p>Massachusetts</p>	<p>310 CMR 7.26          - (24) Non-Heatset Operations,          (27) Printers with Heatset Presses or Non-conforming Operations</p>	<p>Complex, but less than major  <a href="http://www.mass.gov/dep/service/regulations/310cmr07.pdf">http://www.mass.gov/dep/service/regulations/310cmr07.pdf</a></p>
<p>Missouri</p>	<p>10 CSR 10-2.340 and 10 CSR 10-5.442, Control of Emissions from Lithographic Printing</p>	<p>2.340 Kansas City  <a href="http://www.sos.mo.gov/adrules/csr/current/10csr/10c10-2.pdf">http://www.sos.mo.gov/adrules/csr/current/10csr/10c10-2.pdf</a>          (B) This regulation shall apply to installations that have calculated actual volatile organic compound (VOC) emissions for a known number of crewed hours, increased by the amount by weight of VOCs whose emission into the atmosphere is prevented by the use of air pollution control devices and extrapolated to eight thousand seven hundred sixty (8,760) hours per year equal to or greater than one hundred (100) tons per year from offset lithographic printing presses after December 9, 1991. The following factors shall be taken into consideration unless an alternative          5.442 St. Louis  <a href="http://www.sos.mo.gov/adrules/csr/current/10csr/10c10-5.pdf">http://www.sos.mo.gov/adrules/csr/current/10csr/10c10-5.pdf</a>          (B) This rule shall apply only to installations described in subsection (2)(A) which have ever had the potential to emit VOCs equal to or greater than one hundred (100) tons per year. Once the installation exceeds the applicability level of this rule, it shall remain subject to this rule even if its potential emissions drop below the applicability level.          (C) This rule shall not apply to printing on fabric, metal or plastic.</p>

**DRAFT CTG for Offset Lithographic Printing and Letterpress Printing**  
**Docket No. EPA-HQ-OAR-2006-0536**

New Hampshire	<p>Env-A 1204.37</p> <p>-</p> <p>Applicability</p> <p>Criteria and</p> <p>Compliance</p> <p>Standards</p>	<p><a href="http://www.des.state.nh.us/Rules/pdf/env-a1200.pdf">http://www.des.state.nh.us/Rules/pdf/env-a1200.pdf</a></p> <p>(a) A source whose offset lithographic printing operations have combined TPE during any consecutive 12-month period after December 31, 1989 which equal or exceed 50 tons of VOCs shall be subject to the provisions of this section.</p> <p>(cy) "Theoretical potential VOC emissions" (TPEs) means the emissions of VOCs that would have occurred prior to the application of add-on control required by a federally enforceable rule or document issued prior to January 1, 1990, based on one of the following:</p> <p>(1) Continuous operation of 8760 hours per year under maximum production capacity, which for coating and graphic arts source includes coatings and inks with the highest VOC content used in practice by the source during 1993 and 1994 or the 2-year period most representative of normal production rates; or</p> <p>(2) Hours of operation, process conditions, or both that are limited by federally enforceable permit conditions;</p>
---------------	---	---

**DRAFT CTG for Offset Lithographic Printing and Letterpress Printing**  
**Docket No. EPA-HQ-OAR-2006-0536**

<p>New York</p>	<p>6 Part 234 - Graphic Arts</p>	<p><a href="http://www.dec.state.ny.us/website/regs/part234.html">http://www.dec.state.ny.us/website/regs/part234.html</a></p> <p>NYC metro</p> <p>(b) Any packaging rotogravure, publication rotogravure, flexographic, offset lithographic printing process or screen printing process at any facility located in the New York City metropolitan area, regardless of its annual potential to emit volatile organic compounds, must comply with this Part according to the following schedule.</p> <p>(3) . . . Any offset lithographic printing process which was constructed on or before September 1, 1988 regardless of annual potential to emit must have demonstrated compliance with this Part by May 15, 1991.</p> <p>(4) Any owner or operator of a packaging rotogravure, publication rotogravure, flexographic or offset lithographic printing process which was constructed after September 1, 1988 must have demonstrated compliance with this Part upon start-up.</p> <p>Lower Orange County metro</p> <p>(c) Any owner or operator of a packaging rotogravure, publication rotogravure, flexographic or offset lithographic printing process or screen printing process at any facility located in the Lower Orange County metropolitan area must comply with this Part according to the following schedule:</p> <p>(3) Any owner or operator of a packaging rotogravure, publication rotogravure, flexographic, offset lithographic printing process or screen printing process at any facility for which the annual potential to emit volatile organic compounds from all sources regardless of process type, but excluding combustion installations, at the facility equal or exceed 25 tons must:</p> <p>Rest of state</p> <p>(d) Any owner or operator of a packaging rotogravure, publication rotogravure, flexographic, offset lithographic printing process, or screen printing process at any facility located outside the New York City metropolitan area and Lower Orange county metropolitan area must comply with this Part according to the following schedule:</p> <p>(3) Any owner or operator of a packaging rotogravure, publication rotogravure, flexographic, offset lithographic printing process, or screen printing process at any facility for which the annual potential to emit volatile organic compounds from all sources regardless of process type, but excluding combustion installations, at the facility equal or exceed 50 tons must:</p>
<p>North Carolina</p>	<p>15A NCAC 02Q.0803 - Coating, Solvent Cleaning, Graphic Arts</p>	<p>This is a title V exclusionary rule, not a RACT rule</p> <p><a href="http://daq.state.nc.us/rules/rules/Q0800.pdf">http://daq.state.nc.us/rules/rules/Q0800.pdf</a></p> <p>Mecklenburg County VOC rules (nothing on litho)</p> <p><a href="http://tinyurl.com/peemj">http://tinyurl.com/peemj</a></p>

**DRAFT CTG for Offset Lithographic Printing and Letterpress Printing**  
**Docket No. EPA-HQ-OAR-2006-0536**

	Operations	
Tennessee	1200-3-18.43  - Offset  Lithographic  Printing  Operations	<a href="http://www.state.tn.us/sos/rules/1200/1200-03/1200-03-18.pdf">http://www.state.tn.us/sos/rules/1200/1200-03/1200-03-18.pdf</a>  <b>1200-3-18-.43 OFFSET LITHOGRAPHIC PRINTING OPERATIONS.</b> (1) Applicability of this rule is as follows: (a) This rule applies to offset lithographic printing operations in Davidson, Rutherford, Shelby, Sumner, Williamson, and Wilson Counties. (b) The emission limits of this rule do not apply to offset lithographic printing operations within any facility whose potential VOC emissions from all offset lithographic printing operations within the facility are less than 100 tons of volatile organic compounds (VOC's) per year
Texas	30 Section  115.442 -  Control  Requirements	<a href="http://www.tceq.state.tx.us/assets/public/legal/rules/rules/pdflib/115e.pdf">http://www.tceq.state.tx.us/assets/public/legal/rules/rules/pdflib/115e.pdf</a>  starts at 115.440  <b>§115.449. Counties and Compliance Schedules.</b> (a) In El Paso County, all offset lithographic printing presses shall be in compliance with §§115.442, 115.443, 115.445, and 115.446 of this title (relating to Control Requirements; Alternate Control Requirements; Testing Requirements; and Monitoring and Recordkeeping Requirements) as soon as practicable, but no later than November 15, 1996. (b) In Collin, Dallas, Denton, and Tarrant Counties, all offset lithographic printing presses on a property which, when uncontrolled, emit a combined weight of volatile organic compound (VOC) equal to or greater than 50 tons per calendar year, shall be in compliance with §§115.442, 115.443, 115.445, and 115.446 of this title as soon as practicable, but no later than December 31, 2000. (c) In Collin, Dallas, Denton, and Tarrant Counties, all offset lithographic printing presses on a property which, when uncontrolled, emit a combined weight of VOC less than 50 tons per calendar year, shall be in compliance with §§115.442, 115.443, 115.445, and 115.446 of this title as soon as practicable, but no later than one year, after the commission publishes notification in the <i>Texas Register</i> of its determination that this contingency rule is necessary as a result of failure to attain the national ambient air quality standard (NAAQS) for ozone by the attainment deadline or failure to demonstrate reasonable further progress as set forth in the 1990 Amendments to the Federal Clean Air Act (FCAA), §172(c)(9). (d) In Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, all offset lithographic printing presses on a property which, when uncontrolled, emit a combined weight of VOC equal to or greater than 25 tons per calendar year, shall be in compliance with §§115.442, 115.443, 115.445, and 115.446 of this title as soon as practicable, but no later than December 31, 2002. (e) In Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties, all offset lithographic printing presses on a property which, when uncontrolled, emit a combined weight of VOC less than 25 tons per calendar year, shall be in compliance with §§115.442, 115.443, 115.445, and 115.446 of this title as soon as practicable, but no later than one year, after the commission publishes notification in the <i>Texas Register</i> of its determination that this contingency rule is necessary as a result of failure to attain the NAAQS for ozone by the attainment deadline
Virginia	9 VAC 5-40-  7820 -  Standard for  Volatile	<a href="http://www.deq.virginia.gov/air/regulations/air40.html">http://www.deq.virginia.gov/air/regulations/air40.html</a>  see article 53  9VAC5-40-7800. Applicability and designation of affected facility.  A. Except as provided in subsections C, D, and E of this section, the affected facility to which the provisions of this article apply is each lithographic printing process which uses a substrate other than a textile.  B. The provisions of this article apply only to sources of volatile organic compounds in the Northern Virginia or Richmond Volatile Organic Compound Emissions Control Area designated in 9VAC5-20-206.

**DRAFT CTG for Offset Lithographic Printing and Letterpress Printing**  
**Docket No. EPA-HQ-OAR-2006-0536**

	<p>Organic Compounds</p>	<p>C. Exempted from the provisions of this article are facilities in the Northern Virginia Volatile Organic Compound Emissions Control Area whose potential to emit is less than 10 tons per year of volatile organic compounds, provided the emission rates are determined in a manner acceptable to the board. All volatile organic compound emissions from printing inks, coatings, cleaning solutions, and fountain solutions shall be considered in applying the exemption levels specified in this subsection.</p> <p>D. Exempted from the provisions of this article are facilities in the Richmond Volatile Organic Compound Emissions Control Area whose potential to emit is less than 100 tons per year of volatile organic compounds, provided the emission rates are determined in a manner acceptable to the board. All volatile organic compound emissions from printing inks, coatings, cleaning solutions, and fountain solutions shall be considered in applying the exemption levels specified in this subsection.</p> <p>E. The provisions of this article do not apply to the following:</p> <ol style="list-style-type: none"> <li>1. Printing processes used exclusively for determination of product quality and commercial acceptance provided: <ol style="list-style-type: none"> <li>a. The operation is not an integral part of the production process;</li> <li>b. The emissions from all product quality printing processes do not exceed 400 pounds in any 30 day period; and</li> <li>c. The exemption is approved by the board.</li> </ol> </li> <li>2. Photoprocessing, typesetting, or imagesetting equipment using water-based chemistry to develop silver halide images.</li> <li>3. Platemaking equipment using water-based chemistry to remove unhardened image-producing material from an exposed plate.</li> <li>4. Equipment used to make blueprints.</li> <li>5. Any sheet-fed offset lithographic press with a cylinder width of 26 inches or less.</li> </ol>
<p>Wisconsin</p>	<p>NR 422.142 - Lithographic Printing, NR 423.035 - Industrial Cleaning Operations</p>	<p><a href="http://www.legis.state.wi.us/rsb/code/nr/nr422.pdf">http://www.legis.state.wi.us/rsb/code/nr/nr422.pdf</a></p> <p><b>NR 422.142 Lithographic printing. (1) APPLICABILITY.</b>  (a) This section applies to all lithographic printing presses at any facility which is located in the county of Kenosha, Kewaunee, Manitowoc, Milwaukee, Ozaukee, Racine, Sheboygan, Washington or Waukesha and which has maximum theoretical emissions of VOCs from all lithographic printing presses at the facility greater than or equal to 755.7 kilograms (1666 pounds) in any month.  (b) To determine VOC emissions under par. (a), the VOC content of a lithographic ink shall be multiplied by 0.8 for a heatset ink, or multiplied by 0.05 for a non-heatset ink, to account for VOC retention on the substrate.</p>

**State and Local Rules for Offset Lithographic Printing  
Fountain Solution Limits**

1) San Joaquin Valley Unified Air Pollution Control District  
Effective 9/17/2000 – 8 percent VOC by volume as applied

2) San Diego County Air Pollution Control District  
15 percent by volume VOC as applied

3) South Coast Air Quality Management District  
Effective January 1, 2000 – 80 grams per liter VOC as applied or 100 grams per liter as applied if a refrigerated chiller is used

4) Bay Area AQMD  
8 percent VOC by volume

5) Delaware  
**For heatset web presses:** 1.6 percent or less by volume or 3 percent or less by volume if the fountain solution is refrigerated to less than 15.6 °C (60 °F)

**For non-heatset web presses:** alcohol content in the fountain solution shall be eliminated; non-alcohol additives or alcohol substitutes may be used to accomplish the total elimination of alcohol use

**For sheet-fed presses:** 5 percent or less by volume or 8.5 percent or less by volume if the fountain solution is refrigerated to below 15.6 °C (60 °F)

**Any type of offset lithographic printing press** is in compliance if the only VOC's in the fountain solution are in non-alcohol additives or alcohol substitutes so that the concentration of VOCs' in the fountain solution is 3 percent or less by weight. (The fountain solution shall not contain any alcohol.)

6) Georgia  
8 percent or less by volume VOC

7) Illinois  
8 percent or less VOC by weight

8) Kansas  
Continuously contain 10 percent or less by weight of alcohol (alcohol is defined as isopropanol or isopropyl alcohol) or fountain solution is refrigerated to a temperature of 55 °F or less for alcohol-based solutions

9) Maryland

8.5 percent isopropyl alcohol by weight; fountain solution is refrigerated to maintain a temperature of less than 55 °F if isopropyl alcohol is used

10) Massachusetts

**For facilities that will not have a usage rate of all VOC-containing compounds exceeding 670 gallons per calendar month or a facility-wide emission rate of VOC exceeding 2.5 tons per calendar month:**

**Non-heatset:** for web presses installed on or after May 1, 1998, the fountain solution shall not contain any alcohol.

**Sheet-fed presses with cylinder widths greater than 21 inches:** 3 percent alcohol by volume, or 5 percent alcohol by volume and fountain solution refrigerated to a temperature of less than 60 °F.

**Sheet-fed presses with cylinder widths less than or equal to 21 inches:** 5 percent alcohol by volume

**Newspaper printing – 0 percent alcohol**

Any VOC-containing additive other than alcohol shall be limited to a mix ratio that will result in a VOC concentration in the fountain solution, excluding alcohol, equal to or less than 2.5 percent volume by alcohol.

**For facilities with the potential to emit, before the application of air pollution control equipment, equal to or greater than 50 tons per year of VOC (310 CMR 7.18(25)(a):**

**Sheet-fed offset lithographic press using propanol in fountain solution:** 5 percent VOC by volume as applied or 8 percent VOC by volume as applied with fountain solution refrigerated to a temperature below 60 °F

**Web fed offset lithographic press using propanol in fountain solution:** 1.6 percent VOC by volume as applied or 3 percent VOC by volume as applied with fountain solution refrigerated to a temperature below 60 °F

**Non-heatset web-fed offset lithographic press:** 0 percent propanol and maintain a total VOC concentration of 2.5 percent or less by weight

**Propanol Substitute Requirements:** Any person subject to 310 CMR 7.18(25)(a), who owns, leases, operates, or controls an offset lithographic press with fountain solution with propanol

substitutes, containing a concentration of VOC in the fountain solution at 3.0 percent by volume or less, shall be considered in compliance with the VOC emission limitations for fountain solutions contained in 310 CMR 7.18(25).

**For large printers<sup>1</sup> and midsize printers<sup>2</sup>:**

The following standards apply to midsize and large printers, except that they do not apply to the fountain solution in a press with a fountain solution reservoir that holds less than or equal to one gallon.

**Web-fed Presses:** fountain solution shall not contain any alcohol.

**Sheet-fed Presses:**

- a. unrefrigerated fountain solution containing alcohol shall contain no more than 5 percent VOC by weight, including but not limited to alcohol, and;
- b. refrigerated fountain solution containing alcohol shall contain no more than 8 percent VOC by weight, including but not limited to alcohol, and shall be refrigerated to a temperature of less than 60° F.

<sup>1</sup> **Large printer** - a printer that uses a total of more than 3,000 gallons of cleanup solution and inks/coatings/adhesives with a VOC content greater than 10 percent by weight as applied, per rolling 12 month period, where incidental material, ink used in non-heatset offset lithographic printing, waterbased ink/coating/adhesive, plastisol and ultraviolet ink are excluded from this calculation

<sup>2</sup> **Midsize printer** - a printer that uses a total of more than 275 and no more than 3000 gallons of cleanup solution and inks/coatings/adhesives with a VOC content greater than 10 percent by weight as applied, per rolling 12 month period, or that uses a total of more than 55 gallons of alcohol per rolling 12 month period and a total of no more than 3000 gallons of cleanup solution, and inks/coatings/adhesives with a VOC content greater than 10 percent by weight as applied, per rolling 12 month period, where incidental material, ink used in non-heatset offset lithographic printing, water-based ink/coating/adhesive, plastisol and ultraviolet ink are excluded from this calculation

11) Missouri

**(Kansas City)** 10 percent or less alcohol by weight and fountain solution refrigerated to 55 °F or less for alcohol based solutions

**(St. Louis) heat set web:** 1.6 percent or less by volume of alcohol, or 3 percent or less by volume of alcohol and fountain solution is refrigerated to a temperature of 60 °F or less, or 5 percent or less by volume of alcohol substitutes

**(St. Louis) sheet-fed:** 5 percent or less by volume of alcohol, or 8.5 percent or less by volume of alcohol and fountain solution is refrigerated to a temperature of 60 °F or less, or 5 percent or less by volume of alcohol substitutes or combination of alcohol and alcohol substitutes

**(St. Louis) non-heatset web:** 5 percent or less by volume of alcohol substitutes, or 5 percent or less by volume of a combination of alcohol and alcohol substitutes

12) New Hampshire

**Heatset web:** 1.6 percent or less by weight, or 3 percent or less by weight if the fountain is refrigerated to a temperature below 60 °F, or 5 percent or less by weight if the fountain solution contains no alcohol

**Sheet-fed:** 5 percent VOC or less by weight, or VOC content of 8.5 percent or less by weight if the fountain solution is refrigerated to a temperature below 60 °F

**Fountain solution used in a non-heatset web-fed offset lithographic printing process, including both newspaper and non-newspaper facilities,** shall contain no alcohol and the concentration of total VOC's shall not exceed 5 percent by weight in the final solution.

13) New York

10 percent or less by weight of VOC

14) North Carolina

None found

15) Tennessee

**Heatset web:** 1.6 percent VOC by volume as applied, or 3 percent VOC by volume as applied if the fountain solution is refrigerated to less than 60 °F, or 4.6 percent VOC by volume as applied and use no alcohol in the fountain solution, or 6 percent VOC by volume as applied if the fountain solution is refrigerated to less than 60 °F and use no alcohol in the fountain solution

**Non-heatset web:** No owner or operator of a non-heatset web offset printing press subject to this rule shall apply any fountain solution that contains alcohol, nor shall any fountain solution be applied unless the VOC content is equal to or less than 5 percent by weight of the fountain solution as applied.

**Sheet-fed:** 5 percent VOC by volume as applied, or 8.5 percent by volume as applied if the fountain solution is refrigerated to less than 60 °F

16) Texas

**Heatset web:** Any person who owns or operates a heatset web offset lithographic printing press that uses alcohol in the fountain solution shall maintain total fountain solution alcohol to 5.0 percent or less by volume. Alternatively, a standard of 10.0 percent or less by volume alcohol may be used if the fountain solution containing alcohol is refrigerated to less than 60 degrees Fahrenheit.

**Nonheatset web newspaper:** Eliminate the use of alcohol in the fountain solution. Non-alcohol additives or alcohol substitutes can be used to accomplish the total elimination of alcohol use.

**Nonheatset web non-newspaper:** 5.0 percent or less by volume or 10.0 percent or less by volume alcohol may be used if the fountain solution is refrigerated to less than 60 °F.

**Sheet fed:** 10.0 percent or less by volume or 12.0% or less by volume alcohol may be used if the fountain solution is refrigerated to less than 60 °F.

Any person who owns or operates any type of offset lithographic printing press shall be considered in compliance with the fountain solution limitations of this paragraph if the only VOCs in the fountain solution are in nonalcohol additives or alcohol substitutes, so that the concentration of VOCs in the fountain solution is 3.0 percent or less by weight. The fountain solution shall not contain any isopropyl alcohol.

17) Virginia

**Heatset web:** a. When the fountain solution contains alcohol: (1) The fountain solution shall contain no more than a daily average of 1.6 percent volatile organic compounds by weight; or (2) The temperature of the fountain solution shall be maintained at or below 60 °F and the fountain solution shall contain no more than a daily average of 3.0 percent volatile organic compounds by weight; or

b. When the fountain solution contains no alcohol, the fountain solution shall contain no more than a daily average of 5.0 percent volatile organic compounds by weight.

**Non-heatset web presses and each newspaper presses:** the fountain solution shall contain no alcohol and shall contain no more than a daily average of 5.0 percent volatile organic compounds by weight.

**Sheet-fed press:** a. The fountain solution shall contain no more than a daily average of 5.0 percent volatile organic compounds by weight; or

b. The temperature of the fountain solution shall be maintained at or below 60 °F and the fountain solution shall contain no more than a daily average of 8.5 percent volatile organic compounds by weight.

18) Wisconsin

**Heatset web presses:** any person who owns or operates a heatset web lithographic printing press shall, when printing on a substrate other than metal, metal-foil or plastic, use a fountain solution which has a VOC content as applied of no more than one of the following:

- a) 1.6 percent by weight if the fountain solution contains any restricted alcohol and is not refrigerated to 60 °F or less.
- b) 3.0 percent by weight if the fountain solution contains any restricted alcohol and is refrigerated to 60°F or less.
- c) 5.0 percent by weight if the fountain solution contains no restricted alcohol.

**Non-heatset web presses:** any person who owns or operates a non-heatset web lithographic printing press shall, when printing on a substrate other than metal, metal-foil or plastic, use a

fountain solution which has a VOC content as applied of no more than 5.0 percent by weight and which contains no restricted alcohol.

**Sheet-fed presses:** any person who owns or operates a sheet-fed lithographic printing press shall, when printing on a substrate other than metal, metal-foil or plastic, use a fountain solution which has a VOC content as applied of no more than one of the following:

- a. 5.0 percent by weight.
- b. 8.5 percent by weight if the fountain solution is refrigerated to 60 °F or less.

**Metal, metal-foil or plastic substrates:** any person who owns or operates any lithographic printing press shall, when printing on a metal, metal-foil or plastic substrate, use a fountain solution which has a VOC content as applied of no more than one of the following:

- a. 13.5 percent by weight if the fountain solution contains any restricted alcohol and is refrigerated to 60 °F or less.
- b. Not more than 1.6 percent by weight if the fountain solution contains any restricted alcohol and is not refrigerated to 60 °F or less or 5.0 percent by weight if the fountain solution contains no restricted alcohol for **heatset web**; not more than a VOC content as applied of 5.0 percent by weight and which contains no restricted alcohol for **non-heatset web**; and not more than a VOC content as applied of 5.0 percent by weight for **sheet-fed presses**.

## Appendix C

### State and Local Rules for Letterpress Printing

#### Letterpress State and Local Rules – Ink VOC Content Limits

State	Ink VOC Content Limit (lb/gal as applied, less water)
San Diego Rule 67.16	2.5
San Joaquin Valley <sup>1</sup> Rule 4607	2.5
South Coast <sup>1</sup> Rules 1130 (printing) and 1171 (cleaning)	2.5
Massachusetts 310 CMR 7.26 – (25)	2.5
Wisconsin <sup>2</sup> NR 423.035 (cleaning)	----

1. This limit is expressed as lb/gal as applied, less water and less exempt compounds.

2. Wisconsin only has rules for industrial solvent cleaning operations.

#### Letterpress State and Local Rules – Cleaning Solutions

State	Cleaning Solution VOC Content Limit (grams/liter)	Cleaning Solution VOC Composite Partial Vapor Pressure, millimeters of mercury (mm Hg) at 20 °C	Cleaning Solution VOC Content Limit (lb/gal)
San Diego <sup>1</sup>	200	45	
San Joaquin Roller Wash – Step 1	600	10	5.0
San Joaquin Roller Wash – Step 2, Blanket Wash, and On-press Components	800	10	6.7
San Joaquin Removable Press Components	50	10	0.42
South Coast Roller Wash – Step 1	500		4.2

**DRAFT CTG for Offset Lithographic Printing and Letterpress Printing**  
**Docket No. EPA-HQ-OAR-2006-0536**

South Coast Roller Wash – Step 2, Blanket Wash, and On-press Components	500		4.2
South Coast Removable Press Components	25		0.21
Massachusetts		25	
Wisconsin On-press Components <sup>2</sup>			
Wisconsin Removable Press Components	50		0.42

1. Total vapor pressure
2. A minimum VOC content of 30% by weight