TECHNICAL SUPPORT DOCUMENT (TSD) FOR TITLE V PERMITTING OF PRINTING FACILITIES

Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711

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ACRONYMS AND ABBREVIATIONS

ACT	Alternative Control Technique
ASTM	American Society for Testing and Materials
BACT	best available control technology
C_1	carbon
C_6H_{14}	hexane
CAA	Clean Air Act
CAM	compliance assurance monitoring
CEMS	continuous emissions monitoring system
CFR	Code of Federal Regulations
CMS	continuous monitoring system
COMS	continuous opacity monitoring system
CPDS	certified product data sheets
CPMS	continuous parametric monitoring system
CTG	Control Technique Guideline
EIIP	Emission Inventory Improvement Program
EMC	Emissions Measurement Center
EPA	U.S. Environmental Protection Agency
FESOP	federally-enforceable State operating permit program
FIP	Federal Implementation Plan
GARs	generally applicable requirements
HAP	hazardous air pollutant
IR	infrared
LAER	lowest achievable emissions rate
LLMB	liquid-liquid material balances
MACT	maximum achievable control technology
MRRT	monitoring, reporting, recordkeeping, and testing
MSDS	material safety data sheet
MW	molecular weight
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standard for Hazardous Air Pollutants
NSPS	new source performance standard
NSR	new source review
O&M	operation and maintenance
OAQPS	Office of Air Quality Planning and Standards
OSHA	Occupational Safety and Health Administration
PALs	Plantwide Applicability Limitations
ppmv	parts per million by volume
PPR	product and packaging rotogravure
PR	publication rotogravure

PS	performance specifications
PSD	prevention of significant deterioration
PTE	potential-to-emit
QA	quality assurance
QC	quality control
RACT	reasonably available control technology
RTD	resistance temperature detector
scfm	standard cubic feet per minute
SIP	State Implementation Plan
SSM	start-up, shutdown, and malfunction
TGD	Technical Guidance Document
tpy	tons per year
TSD	technical support document
U.S.	United States
USC	United States Code
VE	visible emissions
VOC	volatile organic compound
WWF	wide-web flexographic
WPN1	White Paper Number 1
WPN2	White Paper Number 2

CHAPTER 1
OVERVIEW

While commonly considered industries dominated by small businesses, the printing and packaging industries have their share of title V and federally-enforceable State operating permit (FESOP) program facilities. This is because many printing and packaging firms are located within urban areas where ambient air quality may not meet current federal standards. The Clean Air Act (CAA) establishes lower thresholds for major sources in urban areas designated nonattainment. These lower thresholds have caused many more businesses to become subject to title V and FESOP permitting. More than 2,000 printing and packaging facilities are expected to require CAA title V operating permits. Thousands more require other types of air permits.

The printing and packaging industries present unique challenges in the air permitting arena due to the diverse applications that exist within it as well as within individual facilities. In the printing and packaging industries, several different types of processes are employed, including lithographic, screen printing, flexographic, rotogravure, letterpress, and digital printing. Some facilities will exclusively use one of these printing process types, but it is not uncommon to find one or more of these processes used in the larger operations. For a detailed description of the activities involved in each of the different printing processes, see Appendix A.

Printers frequently use materials that generate both volatile organic compound (VOC) and hazardous air pollutant (HAP) emissions. The HAP emissions from such operations are also typically VOC emissions. As a result, these operations have received considerable attention by State and Federal CAA programs that target these pollutants. Many State Implementation Plans (SIPs) for managing air quality include requirements for using reasonably available control technology (RACT) to control emissions of VOCs. Many SIPs also include new source review (NSR) requirements that govern facility expansions and create additional requirements for controlling emissions from new and modified emissions units. Some technologies are also subject to new source performance standards (NSPS). Printing facilities employing wide web flexographic and/or rotogravure printing operations that use significant quantities of HAPs can also be subject to standards regulating HAP emissions, such as those based on the maximum available control technology (MACT).

The CAA requires that each major source of regulated air pollutants obtain a title V operating permit [see 42 United States Code (USC). § 7661a(a)]. The permit is intended to compile the requirements that apply from each of the different CAA programs. The permit identifies these requirements – also known as applicable requirements – which include, but are not limited to, emissions limitations and standards, and monitoring, recordkeeping, reporting, and testing (MRRT) procedures. As a permit writer, you develop title V permit terms and conditions that are verifiable and enforceable from a practical standpoint and that assure compliance with all applicable requirements. The MRRT procedures contained in the permit provide facilities with the ability to demonstrate compliance with the emissions limitations on a continuous basis.

During the development and issuance of title V permits, several issues have been identified that are related to permitting printing facilities and other VOC emitters. The issues have generally concerned monitoring and testing, practical enforceability, the application of relevant National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements, certain conditions in existing NSR permits treatment of insignificant sources, and promoting operational flexibility. This document is intended to help you (i.e., State/local permitting authorities) address these issues. The document is primarily a summary of prior guidance that we have issued relating to VOC emitters, including the printing and other surface coating industries. The document also includes some new approaches that are based on our regulations. Printer-based examples are used throughout this document, but you may wish to consider using the described approaches for other types of air permitting (e.g., NSR), and for other VOC emitters, particularly other types of surface coaters, as appropriate.

1.1 WHAT IS THE PURPOSE OF THIS DOCUMENT?

Consistent with our goals to support effective, streamlined implementation of title V and other State permit programs, we have developed this technical support document (TSD) to assist you in issuing and revising such permits for printing, packaging, and other VOC emitters. We hope that, in addition to providing assistance to you, this document will also benefit environmental management personnel at these facilities and the public who will be reviewing and commenting on the draft title V permits.

We, the United States Environmental Protection Agency (EPA), have developed approaches that we believe are likely to be acceptable in many circumstances for printers and other surface coating facilities subject to title V. We also believe that several of the approaches described in this document may be suitable for non-title V sources that are subject to other air permitting, such as FESOPs. However, this document does not preclude other approaches or guarantee that the approaches described in this document will be acceptable in a particular case. Therefore, you should consider what is appropriate for each facility based on a number of factors including the magnitude of emissions relative to the different permitting thresholds, the applicant's process technology, and, most importantly, the relevant applicable requirements.

Considerable time may be spent by you in preparing a title V permit for a printer or other VOC emitting sources. We have discussed the techniques described in this document with representatives from States and industry, and we have solicited public comments on a prior draft of this document. We hope that these techniques will help you to reduce the amount of time between submittal of a permit application and the permit's issuance or revision. The benefits gained from use of the techniques will vary depending on the existing State title V procedures, as well as the processes used and requirements relevant to the permit applicant. Faster issuance of effective title V permits can benefit the environment, since title V permits, among other things, incorporate applicable requirements and require certifications from source owners and operators attesting to their compliance with these requirements.

The approaches described in this TSD may be tailored for individual facilities. You should be aware that there may be instances when facilities use compliant coatings or when you permit area sources, where the issuance of a general title V permit (see § 70.6(d)) that meets part 70 requirements, can be appropriate and economical. In some instances, however, a general permit may not be appropriate. For example, facilities that have NSR conditions or potential-to-emit (PTE) limits may require a customized, as opposed to a general, permit. Even so, one or more of the permit approaches described in this document may be appropriate in designing a customized, individual permit. This document, of course, does not preclude other approaches or guarantee that the general permit approaches described in this document will be acceptable in any particular case. As the permitting authority, you should evaluate each title V permit application individually and assure that any permit issued is consistent with the requirements of part 70 and all applicable requirements. We anticipate that using general permits and adapting permit components from other related facilities' permits, where appropriate, may result in significant administrative savings.

1.2 HOW IS THIS DOCUMENT TO BE USED?

This document describes approaches for title V permitting of the printing industry and other VOC/HAP emitters that we believe may be acceptable in many circumstances. This document does not, however, preclude other approaches or guarantee that the approaches described in this document will be acceptable in a particular case. We have developed these approaches based on considerable investigation of permitting issues raised by the printing industry and on comments received when a draft of this document was made available for comment by the public. Nevertheless, we recognize that permitting decisions are case-by-case decisions and that you, as the permitting authority, will review permit applications individually on the merits and issue permits consistent with the requirements of 40 Code of Federal Regulations (CFR) part 70.

The CAA and our regulations for printing facilities contain legally binding requirements. This document describes the relevant provisions of the CAA and the implementing regulations, but does not substitute for those provisions or regulations. This document is not a regulation and imposes no legally binding requirements on anyone, including you, the printing facilities or us. As noted above, our and your decision makers retain the discretion to adopt approaches that differ from the approaches identified in this document. We encourage you to consider whether or not the approaches contained in this document are appropriate for a particular permit.

In this document, we also present illustrative examples for printing facilities. The examples are not meant to be prescriptive, nor do they address all the possible scenarios that you may encounter. We present the examples only as potential models and guides that can be used and adjusted as appropriate for possible inclusion in a title V operating permit for a printer or other VOC emitter. The appropriateness of the examples should be determined by you on a case-by-case basis.

Chapter 4 and Appendix D contain monitoring protocols that may serve as the basis for meeting compliance assurance monitoring (CAM) plan requirements. There are three ways in particular that these protocols can be used in your State. First, if they are approved into your SIP, sources can then rely upon the protocols as being presumptively acceptable monitoring for CAM compliance purposes. Second, to the degree that the source is subject to the monitoring required by Federal standards proposed after November 15, 1990, pursuant to §§ 111 or 112 of the Act, or voluntarily adopts such monitoring requirements that apply to the relevant control device of the source, this would also be presumptively acceptable for CAM compliance. Finally, a source may use the monitoring protocols with a separate demonstration of how the alternative monitoring approach would meet the CAM requirements [see 40 CFR §§ 63.8(f)(2) and 60.13(i)].

The TSD is a living document and may be revised periodically. We welcome additional public comment on this document at any time and will consider those comments in any future revision of the document.

1.3 WHAT ARE THE TITLE V ISSUES RELATED TO THE PRINTING INDUSTRY?

Several issues, including the appropriateness of certain monitoring and testing requirements for demonstrating compliance, and the practical enforceability of these provisions have been identified as they relate to title V permitting of printing and other VOC emitting sources. These issues are discussed in more detail in Chapters 3 through 6. There are significant differences in approaches to monitoring, recordkeeping, reporting, and compliance testing associated with the different requirements applicable to printers. For example, if a wide-web flexographic (WWF) or rotogravure printing facility is subject to the NESHAP for the Printing and Publishing Industry, provisions for demonstrating compliance with subpart KK need to be incorporated into its title V permit along with the relevant SIP and NSR requirements. Where there are multiple, overlapping requirements that apply to a facility, in many instances, streamlining these requirements into one streamlined set of requirements may be appropriate [see “White Paper 2 for Improved Implementation of the part 70 Operating Permits Program” (EPA, 1996a)]. For example, where there are multiple monitoring or testing requirements that apply to a facility, the permit may specify a streamlined set of monitoring or testing requirements consistent with the provisions of 40 CFR § 70.6(a)(3)(i)(A). Where appropriate, streamlining applicable requirements can both simplify compliance demonstration for the facility and clarify expectations being placed on the facility by you.

We have found that some sources have existing permits (e.g., minor NSR permit or FESOP) that contain various conditions that limit emissions below a certain amount. For example, facilities with capture and control systems often have permit limits on the VOC content in applied inks and coatings, or on the usage of specific inks, coatings, and solvents. These limits can constrain how the facilities operate, as well as their VOC emissions. These limits are also a potential disincentive to pursuing pollution prevention, since the benefits from using lower-emitting materials are decreased. Existing NSR and FESOP permits also can contain short-term limits (e.g., hourly or daily) that are unrelated to an applicable requirement, or to an applicable requirement that the facility avoids triggering by agreeing to an enforceable limit (i.e., PTE limit) in the permit. Although these permit conditions are legal and currently effective and enforceable, as a practical matter, these conditions can unnecessarily constrain operational flexibility and sometimes dissuade facilities from pursuing pollution prevention activities. Chapter 6 discusses the possibility of filing a permit revision to replace individual production and operational limits in prior permit(s) with an overall emissions formula.

Table 1-1 presents a summary of the issues that are considered in this document, an overview of the approaches that we believe may be acceptable in many circumstances, and the TSD section reference where the reader can find more details.

1.4 HOW IS THIS REPORT ORGANIZED?

Chapter 2 generally identifies the applicable requirements relevant to the printing industry and provides examples of how those requirements are applied. In Chapter 3, the subpart KK and subpart JJJJ MACT standards are addressed. Chapter 4 discusses emissions monitoring related to applicable requirements such as CAM, PTE limits, MACT, and NSPS. Detailed CAM protocols for the printing and packaging industries are contained in Appendix D. Chapter 5 presents testing issues related to the application of our reference methods, as well as the conditions and frequency for testing units with add-on control equipment. Chapter 6 discusses streamlining options for printing facilities and describes a technique for providing operating flexibility.

The TSD also contains five appendices. Most of these appendices provide examples which further illustrate how the approaches described in the main body of this document may be implemented for printers while again being potentially more broadly available to other VOC emitters.

For smaller sources, such as many lithographic or screen printing operations, the discussion in Chapter 2 on how exempt status from title V can be achieved may be the most important. In addition, Chapter 4 addresses acceptable monitoring and recordkeeping approaches for these sources to use in order to keep minor source status.

Table 1-1. Summary of Approaches For Addressing Title V and Other Permitting Issues for Printers

CATEGORY/ISSUES	APPROACH	SECTION
Title V Applicability		
How can owners or operators of major printing facilities determine potential-to-emit (PTE)?	Our May 2002 guidance, "Preferred and Alternative Methods for Estimating Air Emissions from the Printing, Packaging, and Graphic Arts Industry (EPA, 2002a)," establishes one way to calculate volatile organic compound/hazardous air pollutant (VOC/HAP) emissions. Having the PTE calculation reflect the maximum hourly usage rate, the materials with the highest VOC/HAP content, and the maximum feasible hours of operation may establish an appropriate annual limit. Note that the PTE would be reduced after consideration of any enforceable limits on emissions, hours of operation, and/or material throughput.	2.1.1
What are examples of monitoring, recordkeeping, reporting, and testing (MRRT) requirements that could be used for facilities interested in keeping minor source status?	For sources below the major source threshold, one way to ensure minor source status is to limit the PTE under an enforceable general permit (or a facility's case-specific permit, if one exists), consistent with the printer type, control equipment, and monitoring approaches [see 40 Code of Federal Regulations (CFR) §70.6(d)]. Note that the mass-balance "formula" approach is generally available to permit writers for use in establishing compliance provisions with a PTE limit for other VOC emitting operations, as shown in the United States (U.S.) Environmental Protection Agency's (EPA's) 2002 "Evaluation of Implementation Experiences With Innovative Air Permits - Results of the U.S. EPA Flexible Permit Implementation Review" (EPA, 2002b).	2.1.3 4.2
How can printing equipment be described in a title V permit?	Consistent with 40 CFR § 70.6(a)(3)(i)(A) and our July 10, 1995 guidance, "White Paper for Streamlined Development of part 70 Permit Applications," (EPA, 1995a) equipment should be described in detail sufficient to be linked to applicable requirements. The information should also allow your inspectors to match each individual emissions unit observed during a plant visit with the permit's description for that unit. Only the requisite information regarding emissions limits from equipment descriptions should be included in the permit [see 40 CFR § 70.6(a)(1)].	2.3.2
How can insignificant units and activities be treated?	Consistent with 40 CFR §§ 70.4(b)(14), 70.7(d) and (e): our July 10, 1995 guidance, "White Paper for Streamlined Development of part 70 Permit Applications" (EPA, 1995a) and our March 5, 1996 guidance, "White Paper Number 2 for Improved Implementation of the part 70 Operating Permits Program," a permit can contain provisions to operate/add/delete any activities subject to only generally applicable requirements (GARs), provided that such activities meet all relevant GARs on the permit.	2.3.3

CATEGORY/ISSUES	APPROACH	SECTION
Maximum Achievable Control Technology (MACT) Compliance		
What printing facilities and equipment are subject to subpart KK?	40 CFR § 63.820(a)(1) defines which facilities are subject to subpart KK. Generally, subpart KK applies to publication rotogravure, product and packaging rotogravure, and wide-web flexographic (WWF) operations. Facilities engaged solely in screen printing or offset lithography are not subject to this MACT standard.	3.1
What principles apply to tracking material consumption and recovery, including ancillary and incidental printing operations, under subpart KK?	Permits from MACT facilities should require that material usage and composition be tracked at least monthly [40 CFR § 63.829(b)(i)]. Facilities also may want to consider the approaches in section 4.3 for these material tracking systems.	3.1
How can different compliance options provided for in subpart KK be efficiently incorporated in a title V permit?	A table of compliance demonstration options can in general be incorporated into the permit using citations for associated MRRT provisions and other citations consistent with our March 5, 1996 guidance, "White Paper Number 2 for Improved Implementation of the part 70 Operating Permits Program (WPN2)," where needed [see "White Paper Number 2 for Improved Implementation of the part 70 Operating Permits Program" (EPA, 1996a)].	3.2 Appendix C
Which facilities must submit a Notification of Compliance Status?	Consistent with 40 CFR § 63.830(b)(3), every facility subject to subpart KK's emissions limits must submit a Notification of Compliance Status.	3.3.1
Which facilities must submit summary reports, and when?	Consistent with 40 CFR § 63.830(b)(6), all facilities must submit Semiannual Summary Reports, regardless of the option used to demonstrate compliance. continuous emissions monitoring system (CEMS), continuous parametric monitoring system (CPMS), and materials tracking systems are all considered continuous monitoring system (CMS) within the meaning of the MACT General Provisions. The Semiannual Summary Reports summarize the monitoring data collected over the preceding 6 months, highlighting where malfunction of any instrumental monitor occurred or where the data show deviations from permit requirements. Under some circumstances, additional MACT General Provisions CMS reporting requirements (e.g., Excess Emissions and Monitoring System Performance Reports) may apply. Each Semiannual Summary Report should cover a calendar half (January - June or July - December) and is due by the end of the following month. However, the reporting period can be adjusted to coincide with other reporting requirements by mutual consent of you and the facility.	3.3.2
What is the compliance schedule for subpart JJJJ?	Subpart JJJJ was promulgated on December 4, 2002. The compliance date for existing sources subject to subpart JJJJ is December 5, 2005. In addition, new MACT standards, must be incorporated into existing title V permits within 18 months of the date of promulgation. We provide suggestions for minimizing future permit revisions related to compliance with subpart JJJJ.	3.4.3

CATEGORY/ISSUES	APPROACH	SECTION
Monitoring		
What are the appropriate monitoring parameters for catalytic oxidizers, thermal oxidizers, carbon adsorption systems, and capture systems?	Where applicable, the basis for appropriate parameters are contained in the compliance assurance monitoring (CAM) protocols developed to cover capture systems and control devices. For non-CAM sources, other monitoring may be allowed (e.g., MACT subparts KK and JJJJ).	4.1 Appendix D
What monitoring may be available to demonstrate compliance with a PTE limit?	We recommend use of monitoring elements that will ensure practical enforceability of PTE limits consistent with title V major source requirements and PTE guidance that defines practical enforceability [40 CFR §§ 70.2 and 70.3], and "Guidance on Limiting Potential to Emit in New Source Permitting" (EPA, 1989)). These elements may include monitoring methods, indicator range, monitoring frequency, averaging period, recordkeeping, and quality assurance/quality control (QA/QC) techniques.	4.2
How can materials monitoring be used to demonstrate compliance with subpart KK limits?	We describe general principles and examples for monitoring material consumption, consistent with the requirements of 40 CFR § 63.829(b)(1).	4.3 Appendix E
Do we consider every deviation a violation?	Whether and to what extent a deviation may constitute noncompliance is determined by your individual State authority. The provisions of the federal air operating permit program 40 CFR Part 71 may be instructive for these determinations.	4.3
What may be appropriate opacity monitoring for clean burning combustion sources?	Consistent with our authority to approve alternative monitoring approaches, you may want to consider within your authority to consider other approaches the applicant proposes, a proposal to use clean fuel usage records for demonstrating compliance with particulate matter or opacity requirements in the case of clean burning combustion sources [see 40 CFR §§ 63.8(f)(2) and 60.13(i)].	4.4

CATEGORY/ISSUES	APPROACH	SECTION
When should CPMS and CEMS performance specifications be used?	EPA performance specifications (PS) exist for many types of CEMS [see 40 CFR part 60, appendix B]. Where sources rely on CEMS with PS to provide compliance data, the PS should be used. Note that CEMS with PS may be required by regulation or by permitting authorities in permits. Also note that for a percent removal efficiency calculation using CEMS, sources should monitor not only inlet and outlet concentration but also volumetric flow rate, meaning sources should use PS6, as well as PS8 or PS9. PS for CPMS are under development but do not exist now. Sources subject to CAM must document in a monitoring submittal how the following items as relevant are addressed: indicator(s) of performance, measurement techniques - including detector type, location and installation specifications, inspection procedures, and QA/QC measures - monitoring frequency, averaging time, and monitor out-of-control periods [40 CFR § 64.3(b)]. You and the source owner should become comfortable with a QC program required under § 63.8(d) for facilities subject to MACT. Note that all elements of a CMS QA/QC program may not be appropriate for CPMS. By way of example, drift calibrations are not relevant for manual recordkeeping and need not be addressed.	4.5
What are recommendations for CPMS for subpart KK?	CPMS qualify as CMS under the MACT General Provisions consistent with 40 CFR part 63, subpart A. All the elements included in the CMS provisions apply to CPMS, but some specific CMS provisions may need to be adapted to apply to CPMS properly. We are currently developing performance specifications and QA/QC requirements for common types of CPMS. We have included draft performance specifications and QA/QC requirements in this section. Since the Agency has not yet finalized these specifications and requirements, we therefore are providing them only for your information.	4.5.1

CATEGORY/ISSUES	APPROACH	SECTION
How do subpart KK's CEMS compliance options apply?	Where CEMS are required under subpart KK, facilities should determine the percent removal efficiency for each month based on monitoring the mass flow rate of total organic volatile matter at the inlet and outlet of the control device. In order to calculate the percent removal efficiency for each month, we recommend facilities determine volumetric flow rate (perhaps using a method such as PS6) as well monitor inlet and outlet concentration. Facilities using the CEMS option for solvent recovery systems may monitor volumetric flow rate at only one point (inlet or outlet) provided that the facilities demonstrate that this flow rate is essentially constant across the control device and they implement a good operation and maintenance (O&M) program to detect and repair any leaks in the system. Methods other than CEMS can be used for sources using liquid-liquid mass balance to determine the percent removal efficiency [see 40 CFR § 63.824(b)(1)(i)].	4.5.2
Testing		
What are sources of material composition data?	Consistent with 40 CFR part 63, subpart KK, laboratory measurements (using M24, M24A, or M311) or formulation data [from certified product data sheets (CPDS) or material safety data sheets (MSDS), if they contain the relevant information] can be used.	5.1
Should printers always use M24A for printing inks?	Consistent with our October 17, 2000 *Federal Register Notice* at 65 FR 62043, M24A should be used only for publication rotogravure inks and publication rotogravure coatings. EPA changed the title of M24A to help clarify this.	5.2.1
How can M24 be adjusted for high water content coatings and inks?	A precision adjustment can be made, per our February 3, 1986 policy memo, "Jefferson County APCD's Request for an Opinion on the Suitability of M24 and M24A as Enforcement Tools" [see 40 CFR 60, Appendix A].	5.2.2
Should printers use M24 for non-ink and non-coating materials - such as fountain solutions and cleaning compounds?	No, since M24 applies to paints, varnishes, lacquers, or related surface coatings that contain volatile matter, not to non-ink and non-coating materials. For non-ink and non-coating materials, formulation data from CPDS or MSDS can be used.	5.2.3
How is the VOC content to be determined for thin-film radiation cured coatings, and non-ink products, such as fountain solutions and cleaning compounds?	An American Society for Testing and Materials (ASTM) study is underway to answer this question. Until then, you may want to consider as one option allowing printers to use formulation or supplier data for VOC content of thin-film radiation cured inks and coatings, and non-ink and non-coating materials [see 40 CFR part 63, subpart KK].	5.2.3
What is the relationship between material composition testing under subpart KK and the General Provisions on performance testing?	The facility is responsible for obtaining composition data that meet the requirements of subpart KK [see 40 CFR §§ 63.827(b)(1)-(2) and 63.827(c)(1)-(3)], and is liable if test results do not match formulation data received from suppliers. Section 63.7(f) applies if a facility wishes to rely on an alternative test method for determining material composition.	5.2.4

CATEGORY/ISSUES	APPROACH	SECTION
Are non-lithographic processes eligible for use of a retention factor where low vapor pressure cleaning solvents are used?	Yes. The 50 percent retention factor use is available for all flexographic, rotogravure, letterpress, and screen printing operations, consistent with our June 1994 guidance, "Alternative Control Technique Document: Offset Lithographic Printing.	5.3
Under what conditions can M25A be used to determine the destruction efficiency of an oxidizer?	Consistent with the approach presented in EPA's April 4, 1995 guidance, "EPA's VOC Test Methods 25 and 25A" and codified in subpart KK, M25A can be used for determining outlet concentrations when: 1) an exhaust concentration of 50 or less parts per million by volume (ppmv) as carbon (C_1) is required to comply with the applicable standard; 2) the inlet concentration and the required level of control results in an exhaust concentration of 50 or less ppmv as C_1; or 3) the high efficiency of the control device alone results in an exhaust concentration of 50 or less ppmv as C_1. (See http://www.epa.gov/ttn/emc/guidlnd/gd-033.pdf.) In situations where M25 is not viable, such as those described in section 1.1 of M25, we allow the use of M25A on both the inlet and outlet [see 40 CFR 60, Appendix A and 40 CFR § 63.827(d)(1)(vi)].	5.4
What general principles are relevant to performing capture system and control device testing?	Under 40 CFR § 63.827, initial testing is required for both capture systems and control devices. Depending on the type of capture system and type of control device, ongoing testing may be required under Subpart KK. We present general principles relating to control and capture efficiency testing for various scenarios, as well as examples to illustrate these principles for your consideration.	5.5
When can alternative capture efficiency testing be allowed?	Consistent with 40 CFR §63.825(f)(7), alternative capture efficiency testing can be allowed if the source follows the Data Quality Objective approach or the Lower Confidence Limit approach [see 40 CFR 63, subpart KK, Appendix A]. In addition, for heatset offset lithographic presses can demonstrate capture efficiency requirements by showing that the dryer is operating at negative pressure relative to the pressroom, consistent with the July 1997 letter from EPA's J. Seitz (EPA, 1997), and with the September 1993 guidance, "Control of Volatile Organic Compound Emissions from Offset Lithographic Printing" (EPA, 1993a).	5.5.2
What are the requirements for capture efficiency testing under subpart KK?	Capture efficiency testing is not required for sources using liquid-liquid mass balance to verify compliance. Subpart KK requires capture efficiency testing according to 40 CFR part 52.741 for sources required to demonstrate they meet the permanent total enclosure requirements or that need to establish a capture efficiency for sources not in total enclosures. For additional guidance, we recommend Guidelines for Determining Capture Efficiency, available at the following address <www.epa.gov/ttn/emc/guidlnd/gd-035.pdf>, as well as the Office of Enforcement's *Issuance of the Clean Air Act National Stack Testing Guidance*, released February 2, 2004.	5.6

CATEGORY/ISSUES	APPROACH	SECTION
What are the appropriate performance test conditions?	Consistent with subparts QQ and KK at 40 CFR §§ 60.433(a)(8) and 63.827(d)(1)(vii), with the November 1993 guidance, "Draft Control Techniques Guideline for Offset Lithography," and with the Office of Enforcement's February 2, 2004 guidance "Issuance of the Clean Air Act National Stack Testing Guidance," testing for MACT compliance should be performed at normal operating conditions.	5.7
How can destruction efficiency requirements be met during low flow/concentrations?	Consistent with an approach taken in the Paper and Other Web Coating MACT, subpart JJJJ at 40 CFR § 63.3220(b)(4), allow an outlet concentration of 20 ppmv as hexane (C_6H_{14}) coupled with 100% capture efficiency to be a surrogate for destruction efficiency.	5.8
Additional Permitting Techniques		
How can multiple requirements applying to same emissions unit be streamlined in order to assure compliance with all of the applicable requirements (i.e., focusing compliance on the most rigorous set of requirements)?	Multiple requirements can be streamlined as described in White Paper Number 2 for Improved Implementation of the part 70 Operating Permits Program (WPN2). Based on our pilot permit experience, we believe that streamlining is particularly appropriate where highly efficient add-on controls are used.	6.2
How can existing permits which contain short term limits (e.g., daily that specifically limit the type and amount of materials and/or production) to assure compliance with a PTE limit be changed to allow more operational flexibility?	Where the operational limits were established in new source review (NSR) permits for applicability purposes, many printers (as well as other VOC emitters) may be able to pursue a mass balance based formula to reformat those permit conditions. Before using the formula approach, the permitting authority would, of course, have to approve a permit modification under new source review to remove the prior permit terms and replace them with the formula. Compliance with the formula could then be achieved on an annual basis rolled monthly for all inputs to the formula (i.e., by tracking material usage on a monthly or job basis). Where short-term limits were established in a permit to enforce non-PTE limits, sources may be eligible to use the mass formula-based approach over a longer time period. Appropriate permit modification again would have to occur prior to establishing the formula approach.	6.3

CHAPTER 2
TITLE V PERMITTING REQUIREMENTS

Chapter 2 discusses which printing facilities may be subject to the requirements for obtaining a title V operating permit and how certain facilities can become exempt from these requirements. This chapter also summarizes the different applicable requirements that apply to different printing facilities and addresses the treatment of insignificant activities in a title V operating permit.

2.1 WHAT ARE THE TITLE V APPLICABILITY CRITERIA THAT APPLY TO PRINTING FACILITIES?

Owners or operators of major sources are required to obtain title V operating permits, per 40 CFR §§ 70.3(a)(1) and 70.5(a). Sources which have the PTE "major" quantities of regulated pollutants, such as VOCs or HAPs, are major sources [see 40 CFR § 70.2]. Owners and operators of minor sources, i.e., those sources that emit or have the PTE less than major source thresholds, can also be subject to title V if the units that comprise the facilities are subject to federal emissions standards, including NSPS established under §111 or NESHAP established under §112 of the CAA [see 40 CFR §§ 70.3(a)(2) and (a)(3)]. Once a major printing facility has at least one unit that requires a title V permit, applicable requirements for all significant units must be addressed in the title V permit. For printing facilities, title V applicability is generally triggered by the major source criteria for potential emissions of VOCs or HAPs.

2.1.1 How Can Major Printing Facilities Estimate Potential to Emit?

As part of our Emission Inventory Improvement Program (EIIP), we have established an acceptable method (as well as alternative methods) for estimating facility-wide emissions for emissions inventory purposes (EPA, 2002a). The method conservatively estimates actual emissions, and provides a framework for estimating PTE. The method involves performing a mass balance approach that accounts for materials used in all press operations in the facility and for control efficiency and capture efficiency, as applicable. The method also provides guidance for applying retention factors, where appropriate, that reflect the amount of VOC retained in the substrate. An alternative method uses emissions factors (either site-specific or AP-42) applied to solvent usage estimates. AP-42 emissions factors are developed as averages of reported test data sets and, while useful in supporting a national emissions inventory, are generally not acceptable for site-specific applicability determinations; site-specific developed emissions factors are best. However, you may consider using adjusted AP-42 emissions factors where the adjustment would take into consideration the differences between facilities, the uncertainty in test methods, and the variability in operations.

Calculating PTE for printing operations is not as straightforward as for sources that can document maximum throughput capacities, (e.g., a boiler). Applying the EIIP approach to calculating existing emissions requires the use of data on actual usage rates for individual materials with known VOC/HAP contents. To calculate PTE, we recommend that you use conservative assumptions to project maximum material usage rates and VOC/HAP content for the PTE material balance. PTE represents the "maximum capacity of a stationary source to emit under its physical and operational design. Any physical or operational limitation on the source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation, or on the type or amount of material combusted, stored, or processed shall be treated as part of its design if the limitation is enforceable by the (EPA) Administrator" [see 40 CFR §§ 52.21(b)(4), 51.165(a)(1)(iii), and 51.166(b)(4) see also 40 CFR § 63.2]. Stated differently, the PTE calculation should reflect the maximum hourly usage rate times the worst-case VOC/ HAP content times the maximum feasible hours of operation. The PTE would be reduced after consideration of any enforceable limits on emissions, such as hours of operation and material throughput. The maximum hours of operation, unless limited by permit, should be based on round-the-clock press operation (8,760 hours/year), less time required for makeready/setup as determined by a documented, conservative review of historical data for the facility. As discussed below, there may be ways to constrain PTE reasonably through certain types of permit conditions. .

2.1.2 What are the Major Source Thresholds?

Major source thresholds are established in the CAA and incorporated into our regulations for both "criteria" pollutants and HAPs [see CAA §§ 110, 112, 40 CFR §§ 52.21(b)(4), 51.165(a)(1)(iii), 51.166(b)(4), and 63.2]. The definition of "major source" for purposes of title V is set forth in 40 CFR § 70.2. Major source thresholds for criteria pollutants vary depending on the designated attainment status of the area that contains the sources with the National Ambient Air Quality Standard (NAAQS). For VOC sources, such as printing facilities, the major source applicability criteria are a function of the area's attainment status with respect to the ozone NAAQS. The specific VOC emissions thresholds for defining major sources by ozone NAAQS attainment area designation are set forth in sections 182 and 184 of the CAA and summarized in Table 2-1.

Facilities that use one or more of the HAPs can also be major sources. For the original listing of HAPs, see section 112(b) of the 1990 CAA Amendments, 42 USC § 7412(b). For changes to the HAP list, see 40 CFR part 63 subpart C. For the definition of VOC see 40 CFR part 51.100(s). The definition of VOC includes a listing of organic compounds which have been determined to have negligible photochemical reactivity (exempt compounds) which are therefore not VOC. The major source thresholds for HAPs are set at a PTE of 10 tons per year or more of any individual HAP or 25 tons per year or more of any combination of HAPs (see 40 CFR § 63.2). For printing facilities, HAPs frequently used include toluene, hexane, methyl ethyl ketone, and listed glycol ethers.

It should be noted that major source thresholds have also been established for VOC emissions for purposes of the NSR and prevention of significant deterioration (PSD) programs. For printers, the PSD major source threshold is 250 tons/year potential VOC emissions [see 40 CFR § 51.166(b)(1)(i)(b)]. The CAA requires sources that are major for the NSR and PSD programs to get title V permits.

Table 2-1. VOC Emissions Thresholds

Area Designation	Major Source Threshold Potential VOC Emissions tons/year
Nonattainment Area Designation	
Marginal or Moderate	100
Serious	50
Severe	25
Extreme	10
Attainment Area Designation	
Ozone Transport Region	50
All Other Areas	100

2.1.3 How Does One Maintain Minor Source Status?

A facility is a minor source when it emits or has the potential to emit pollutants below the applicable major source thresholds discussed above. Determining PTE for printers is not straightforward. Several factors are considered in defining a facility PTE, including its maximum annual operating capacity. These factors include such things as the maximum VOC and/or HAP content in applied inks and coatings, the substrate(s) for printing and other coating operations, the maximum substrate processing rates, the number of application points on each press, the maximum feasible application rates for inks and coatings for each press, the effectiveness of any control systems if the degree of control is federally enforceable, and the maximum annual hours of operation that are expected to be 8,760 unless the case is made for needed non-production hours to accommodate press maintenance and turnovers between printing jobs. Ideally, these and other factors would allow you to determine a maximum short-term emissions rate which would then be multiplied by the maximum number of feasible press operating hours.

Printers, not unlike other batch-type industrial operations, may encounter difficulties in determining PTE because often it is not feasible to actually operate a press with all factors needed to define a facility PTE at their theoretical maximum. For example, it may not be feasible for a press to be operated at its maximum substrate processing rate if all printing stations are applying ink/coatings at their maximum application rate.

There is no established policy for weighing the different factors used to determine PTE for batch type operations such as printing. We expect you to work with printers on a case-by-case basis to evaluate their PTE demonstrations against the applicable regulatory requirements when title V applicability hinges on a PTE determination.

In fact, we fully expect there to be situations where differences in assumptions related to what represents maximum capacity will result in PTE determinations that are either *above* or *below* major source thresholds, leading to controversy on what defines PTE. To maintain minor source status the source needs an annual limit on PTE to keep it below the major source threshold. This PTE limit must be established through an enforceable mechanism, such as a FESOP or a general permit. Where PTE limits are needed for multiple printers in the same geographic area or jurisdiction and these printers operate the same printing process (e.g., sheetfed lithographic operations in a nonattainment area), States may have the opportunity to establish PTE limits for multiple printers at the same time by adopting a general permit, consistent with 40 CFR § 70.6(d).

The PTE limit you develop should be enforceable as a practical matter [see "Release of Interim Policy on Federal Enforceability of Limitations on Potential to Emit" (EPA, 1996b)]. As discussed in our 2002 "Evaluation of Implementation Experiences With Innovative Air Permits - Results of the U.S. EPA Flexible Permit Implementation Review," the mass-balance "formula" approach is a simple, practically enforceable approach that is available to permit writers for use in establishing compliance provisions with a PTE limit in a permit (EPA, 2002b). The mass-balance approach is also consistent with the materials usage accounting requirements of 40 CFR subpart KK.

With the formula approach, permit conditions are created in equation form, mathematically relating material usage and emissions. The equations provide for the determination of actual VOC and/or HAP emissions over a set time period based on the quantities of materials consumed during that month, the properties of these materials, and other relevant factors needed to complete the material balance. We recommend establishing the equations' use over month-long time periods and summing consecutive 12-month periods to demonstrate compliance with the annual PTE limit. We describe the formula approach in more detail in section 6.3.2 and provide an example set of equations.

Some sources may rely on capture and control systems to limit emissions and maintain exempt (minor source) status. Consideration of capture and control effectiveness can be included in the formula approach for determining emissions (see section 6). However, if you account for control capture and system effectiveness in the formula approach, you need to include enforceable requirements that ensure that the effectiveness of the capture and control system is maintained. This may be accomplished through monitoring provisions established by applicable requirements.

2.1.4 NESHAP Sources

A source may be a minor source for criteria pollutants, but a major source for HAPs. In such cases, the entire facility would be a "major source." Thus, any NESHAP to which the facility is subject, as well as any other applicable requirement, would be included in its title V permit.

Printers that use publication rotogravure, product and packaging rotogravure, or WWF printing presses may be subject to the NESHAP for the "Printing and Publishing Industry" [see 40 CFR part 63, subpart KK]. Subpart KK sets forth the requirements for facilities that are major HAP sources. Printers may also be subject to the NESHAP for the "Paper and Other Web Coating" [see 40 CFR part 63, subpart JJJJ].

Facilities engaged solely in screen printing, offset lithography, letterpress or narrow-web flexographic printing are not subject to the subpart KK or subpart JJJJ MACT standards.

2.1.4.1 How Can I Avoid Being a Major Source Under Subpart KK?

Subpart KK defines "area source" as any stationary source of HAPs that is not a "major source," as defined in subpart KK [see 40 CFR 63.2]. A source owner or operator may avoid being subject to subpart KK via an area source designation [see 61 FR 27132, 27154 (Table 1 to subpart KK Applicability of General Provisions to subpart KK) ("area sources are not subject to subpart KK") (May 30, 1996)]. Subpart KK provides sources a choice in terms of obtaining area source status.

First, a facility can establish area source status by committing to the HAP *usage* restrictions in 40 CFR § 63.820(a)(2). Section 63.820(a)(2) provides that to establish area source status, the facility must *use* less than 10 tons per each rolling 12-month period for each HAP, or 25 tons per each rolling 12-month period of any combination of HAPs. The accounting of HAP usage against these thresholds includes all materials used for printing and those used for other purposes or processes at the facility. Sources that choose to establish area source status in this manner are only subject to the reporting and recordkeeping requirements at 40 CFR 63.829(d) and 63.830(b)(1) (see 61 FR. 27134). None of the other provisions of subpart KK apply to such a facility [see 40 CFR § 63.820(a)(2)].

In the preamble to the final subpart KK rule, EPA clarified that the provision in the proposed subpart KK rule requiring owners or operators of affected sources to obtain part 70 or part 71 operating permits was eliminated in the final rule because the provision could "have been inadvertently interpreted to require these permits for sources which used the optional provisions of the rule to establish area source status," which was not the intent (61 FR 27138). EPA further explained in the preamble to the final subpart KK rule that sources that elect to establish area source status under 40 CFR 63.820(a)(2) may be required to obtain title V permits if, for example, they are a major source for a criteria pollutant, "but [they] are not required to obtain them as a result of using the optional provision" of § 63.820(a)(2) [see 61 FR 27138; see also 65

FR 49871 and our April 19, 1999 memorandum entitled "Title V Applicability of One-time Reporting" Provisions for Nonmajor Sources" signed by Steven J. Hitte, Office of Air Quality Planning and Standards (EPA, 1999a)].

Second, subpart KK provides facilities the option of limiting their potential to emit HAP through other appropriate mechanisms that may be available through the permitting authority [see 40 CFR § 63.820(a)(7)]. For example, facilities can avoid being subject to subpart KK by accepting enforceable permit conditions that limit HAP emissions to below the 10 and 25 ton rolling 12-month HAP thresholds that are used to define a major source in the CAA and its implementing regulations [see 42 USC 7412(a)(1), 40 CFR § 63.820(a)(7)]. Subpart A of part 63 defines these non-major sources as area sources. Remember that these enforceable permit conditions were to be in place prior to the first compliance date for subpart KK (or any other MACT standard), pursuant to our May 16, 1995 memorandum entitled "Potential to Emit for MACT Standards – Guidance on Timing Issues" (EPA, 1995b). As the permitting authority, you have the discretion to determine what a source owner or operator needs to do to demonstrate that source emissions do not exceed the emissions limits specified in the permit. You also have the discretion to specify – through practically enforceable permit terms and conditions – what records must be maintained to support any demonstration that the source remains in compliance with the emissions limits in its permit. In developing such terms and conditions, we recommend that you consider the type of recordkeeping described at 40 CFR 63.829(d), which calls for an accounting on a monthly basis.

Based on our permitting experience, we have found that the recordkeeping provisions in permits related to compliance with emissions limits vary, and that the level of detail called for in the records generally depends on the gap between the HAP emissions allowed under the permit and the major source threshold. In crafting permit conditions, you may want to consider requiring facilities with emissions limits that are close to the major source threshold and that rely on operational constraints (e.g., a control device) to remain below that threshold (i.e., retain area source status) to keep more detailed records on the operation of the process and control device, perhaps through parameter or other monitoring. In any event, the records required under any permit or other enforceable mechanism should be sufficient to ensure that the source is in compliance with the specified emissions limit. If the facility is required to obtain a title V permit for some reason (e.g., the facility is a major source of VOC), the requirements to demonstrate area source status for HAPs should be specified in the title V permit.

2.1.4.2 What If an Owner or Operator has a Minor Source Subject to Subpart N?

Printing facilities that are minor sources but include chrome plating operations for preparing cylinders may be subject to title V based on applicability of the NESHAP for "Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks" [see 40 CFR part 63, subpart N]. Subpart N applies to chrome operations regardless of size. Subpart N includes a permanent exemption from title V for sources that are not major sources (i.e., area sources) that are decorative chromium electroplating or chromium anodizing operations that use fume suppressants as an emissions reduction technology or any decorative chromium electroplating operation that uses trivalent chromium with a wetting agent [see 40 CFR § 63.340(e)(1)].

For all other non-major sources, the deferral of title V permitting requirements given in subpart N [see 40 CFR § 63.340(e)(2)] expired on December 9, 2004. We are engaged in rulemaking to promulgate either permanent exemptions for these sources from title V or to require permitting for all area sources subject to subpart N that were previously deferred from title V permitting. Because this rulemaking is not complete, sources that were previously deferred are now subject to title V permitting; they have, however, until December 9, 2005 to submit their title V permit applications.

2.1.5 NSPS Sources

Just as NESHAP requirements may trigger title V applicability, NSPS may also trigger the applicability of title V to owners or operators of minor sources. One NSPS, the "Standard of Performance for the Graphic Arts Industry: Publication Rotogravure Printing" [see 40 CFR part 60, subpart QQ], applies to publication rotogravure printing. Since October 28, 1980, the installation of any new, modified, or reconstructed publication rotogravure printing press, regardless of size, triggers subpart QQ. A second NSPS that may apply to printing facilities is "Standards of Performance for Flexible Vinyl and Urethane Coating and Printing" [see 40 CFR part 60, subpart FFF]. The installation of a new, modified, or reconstructed product rotogravure printing line used to print or coat flexible vinyl or urethane products (e.g., vinyl wallpaper and upholstery) since January 18, 1983 is subject to this standard.

2.2 HOW CAN OWNERS OR OPERATORS OF NEW SOURCES BE EXEMPT FROM TITLE V?

Owners or operators of a new source can avoid triggering title V permitting requirements on the basis of major source status by ensuring the source's potential emissions remain below major source thresholds. The requirements that limit the emissions from the facility to minor source status under title V must be enforceable [see EPA, 1996b]. Such enforceability can be achieved through permit programs, including permits issued under FESOP or minor State NSR program as approved in the SIP, or rulemaking under federally approved provisions of the SIP. Source, or source category-specific rules may also serve as SIP revisions to limit potential emissions.

2.3 WHAT ARE THE APPLICABLE REQUIREMENTS?

As a permit writer, you are expected to incorporate all federally-enforceable requirements that apply to each source for controlling air pollution into a title V operating permit, per 40 CFR § 70.6(a)(1). Applicable requirements are defined in 40 CFR § 70.2 and originate from various CAA program areas, including:

- Control of existing air pollution sources by SIPs, often requiring the use of RACT for significant emitters;

- Preconstruction review of new and modified major sources to assure appropriate air quality impacts and the use of best available control technology (BACT) in attainment areas and lowest achievable emissions rate (LAER) technologies in nonattainment areas;

- Federal NSPS for certain new or reconstructed emissions units (affected facilities); and

- CAM rule. [Note that, among other things, the CAM rule does not apply to standards proposed by EPA under section 111 or 112 of the Act after November 15, 1990, see 40 CFR § 64.2(b)(1)(i).]

In addition, publication rotogravure, packaging rotogravure, and WWF printers may also be subject to Federal NESHAPs requiring use of MACT at certain new and existing affected sources to control hazardous air pollutants.

Applicable requirements, as defined in 40 CFR § 70.2, generally include provisions to restrict emissions and to assure practical enforceability with such restrictions, such as:

- **limits on emissions** through maximum or minimum constraints on mass emissions rates, a material throughput, input material properties, capture efficiency, and/or control efficiency

- **work practice standards** that stipulate the use of control equipment, material handling practices, employee training, etc.

- **testing** of performance of capture and control systems and the quality and composition of materials consumed

- **monitoring** emissions or operating parameters representative of capture and control efficiency

- **recordkeeping** of data on material usage, properties, and operating parameters

- **reporting** of results of performance tests and emissions

Facilities may be subject to requirements stemming from more than one program area. The specific provisions in each program area can vary. It is important that you recognize the commonalities and differences in the requirements of each program area in developing the title V permit. As discussed below in Chapter 6, opportunities may exist for streamlining the different applicable requirements during permit development which could benefit both you and the permittee.

2.3.1 Summary of Applicable Requirements for the Major Printing Technologies

To assist in understanding the differences in the applicable requirements that apply to the printing industry, we present below an overview of some of the requirements for the major printing technologies, which include publication rotogravure, packaging rotogravure, and WWF. Tables 2-2, B-1, and B-2 (of Appendix B to this document) generally summarize the potentially applicable requirements for packaging rotogravure and WWF sources that use oxidizers (incinerators), solvent recovery, and compliant inks/coatings, respectively. Table B-3 generally summarizes the typical applicable requirements for publication rotogravure facilities that employ solvent recovery. Note that these tables, in no way, modify or change the regulations that set forth the applicable requirements. Thus, although you may refer to the following tables, the tables are simply general summaries and are not controlling. The regulations are binding and controlling.

The following summary is not intended to imply that all sources are subject to all of the requirements noted below. The examples presented in the tables below were identified as the most common scenarios by industry representatives. We do not summarize below applicable requirements for heatset web offset lithography, non-heatset web offset lithography, sheetfed offset lithography, digital printing, and screen printing. These printing sectors are not subject to a federal MACT or NSPS standard, and RACT rules for these sectors may differ between States or do not exist in certain States. You should check your regulations to verify the presence of any State RACT rules or State-only requirements that apply to these printing processes.

Table 2-2. SUMMARY OF POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic (WWF) with Oxidizer Control Strategy						
Applicable Requirement	**Example SIP-RACT (all subject sources)** [1]	**Example NSR Requirements** [1]	**NSPS (part 60)**		**MACT (part 63)**	
			Subpart A (General Provisions)	**Subpart FFF**	**Subpart A (General Provisions)**	**Subpart KK**
Emissions / Operating Limits	• 90% VOC destruction efficiency • 65% overall control efficiency for packaging rotogravure and 60% for flexographic • Generally applies to emissions from the application of inks and coatings by each individual printing press • May apply hourly or daily with compliance based on performance test and monitoring of control system temperature(s) • May require parameter monitoring for capture and control systems including development and submittal of compliance assurance monitoring (CAM) plan with the initial and/or renewal title V application [§64.1 - §64.10]	• Requirements generally follow SIP-RACT requirements with same or greater stringency for control of emissions • Ranging from 70% to 98% overall control efficiency • May include mass VOC emissions limits and/or mass VOC usage limits to hold potential emissions below permitting thresholds • Generally applies to emissions from the application of inks and coatings by the individual new or modified press or collectively by a group of new/modified presses controlled by the same oxidizer • Requirements established through preconstruction review	• No additional requirements [40 CFR 60, subpart A].	• Applies to new product rotogravure printing and/or coating of flexible (sheet or web) vinyl or urethane products (e.g., vinyl wallpaper, upholstery) [§60.580(a)] • Packaging rotogravure and wide web flexographic printing are NOT subject to subpart FFF • Applies to emissions from the application of inks and coatings by each new rotogravure printing line constructed after 1/18/83 [§60.580(b)] • 85% overall VOC control of each affected facility [§60.582(a)(2)]	• New/reconstructed major sources must submit application for preconstruction review by EPA, or by State program that has been delegated MACT standard enforcement responsibilities [§63.5]	• Applies to major sources of HAPs with product and packaging rotogravure and WWF presses. • Applies to all roto./flexo. presses (together) plus other optional equipment [§63.821(a)(2)] • Overall organic HAP control efficiency of at least 95% each month, *or* • Emissions rate of no more than 0.2 kg organic HAP per kg. solids applied, monthly average, as-applied basis, *or* • Emissions rate of no more than 0.04 kg organic HAP per kg material applied, monthly average, as-applied basis • or option based on weighted calculations between alternatives [§63.825(7), (8), (9), or (10)]

Table 2-2. SUMMARY OF POTENTIALLY APPLICABLE REQUIREMENTS
Product and Packaging Rotogravure or Wide-Web Flexographic (WWF) with Oxidizer Control Strategy

Applicable Requirement	Example SIP-RACT (all subject sources) [1]	Example NSR Requirements [1]	NSPS (part 60)		MACT (part 63)	
			Subpart A (General Provisions)	Subpart FFF	Subpart A (General Provisions)	Subpart KK
Other - Work Practice Standards	• Operation & maintenance of control devices and monitors according to manufacturer recommendations	• Generally same as SIP-RACT requirements	• Operate and maintain affected facility and control equipment consistent with good air pollution control practices [§60.11(d)]	• Same as given in subpart A	• Operate and maintain source and control equipment consistent with good air pollution control practices [§63.6(e)(1)] • Develop and implement a written start-up, shutdown, and malfunction (SSM) plan for affected source and control equipment [§63.6(e)(3)]	Same as given in subpart A

Table 2-2. SUMMARY OF POTENTIALLY APPLICABLE REQUIREMENTS
Product and Packaging Rotogravure or Wide-Web Flexographic (WWF) with Oxidizer Control Strategy

Applicable Requirement	Example SIP-RACT (all subject sources) [1]	Example NSR Requirements [1]	NSPS (part 60)		MACT (part 63)	
			Subpart A (General Provisions)	Subpart FFF	Subpart A (General Provisions)	Subpart KK
Testing	• Initial compliance test of oxidizer destruction efficiency and capture efficiency • Preparation and approval of testing protocol generally required in advance of test • Testing generally required at conditions approaching maximum operating rates • May require periodic re-testing	• Generally same as SIP-RACT requirements	• Conduct performance test 60 -180 days after start-up in accordance with test methods and procedures in applicable standard • Provide at least 30 days notice of scheduled test date [§60.8] • Continuous monitoring systems (CMS) must be subject to a performance evaluation during performance test [§60.13(c)]	• Performance test under, continuous normal operating conditions consisting of 3 runs of at least 30 minutes each measuring destruction and capture efficiency [§60.583(d)] • VOC measurements for destruction efficiency based on M25A [§60.583(a)] • All fugitive VOC emissions shall be captured and vented through stacks suitable for measurement during test [§60.583(d)(4)] • *Thermal* oxidizer test shall determine average oxidizer exhaust temperature [§60.584(b)] • *Catalytic* oxidizer test shall determine average up- and down-stream temperatures for the catalyst bed [§60.584(c)]	• Initial performance test required within 180 days of the effective date of standard or after initial start-up of new unit [§63.7(a)] • Notification of test at least 60 days in advance [§63.7(b)] • Development and, if requested, submittal of site-specific test plan at least 60 days in advance of test [§63.7(c)] • Performance test shall be conducted under normal operating conditions [§63.7(e)] • CMS Performance Evaluations for temperature monitors with initial test [§63.8(e)]	• Initial performance test under normal operating conditions consisting of 3 runs (1 hr. min. each) [§63.827(d)(1)(vii)] • VOC measurements for destruction based on M25 or 25A [§63.827(d)(1)(vi)] • Capture efficiency determined by Procedure T (M204) [§63.827(e)(1)] • *Thermal* oxidizer test shall determine minimum combustion temperature [§63.827(d)(3)] • *Catalytic* oxidizer test shall determine minimum gas temperature upstream of the catalyst bed [§63.827(d)(3)]

Table 2-2. SUMMARY OF POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic (WWF) with Oxidizer Control Strategy						
Applicable Requirement	**Example SIP-RACT (all subject sources)** [1]	**Example NSR Requirements** [1]	**NSPS (part 60)**		**MACT (part 63)**	
			Subpart A (General Provisions)	**Subpart FFF**	**Subpart A (General Provisions)**	**Subpart KK**
Monitoring	• Oxidizer temperature to confirm destruction efficiency	• Oxidizer temperature to confirm destruction efficiency • May require monitoring of parameter for capture efficiency such as enclosure differential pressure	• Required CMS subject to the applicable performance specifications in Appendix B and quality assurance procedures in Appendix F [§60.13(a)] • Monitors installed and operational prior to time of performance test consistent with manufacturer's recommendations for installation, operation, and calibration [§60.13(b)] • Record four or more data points equally spaced over each hour; do not include data recorded during breakdowns, repairs, calibrations, etc. [§60.13(h)]	• For *thermal* oxidizer, install, operate, maintain, and calibrate annually continuous monitor and recorder of temperature of control device exhaust gas; accuracy of ±0.75% of temperature measured or ±2.5°C, whichever is greater [§60.584(b)] • For *catalytic* oxidizer, install, operate, maintain, and calibrate annually continuous monitors and recorders of temperatures upstream and downstream of catalyst bed; accuracy of ±0.75% of temperature measured or ±2.5°C, whichever is greater [§60.584(c)]	• Operate and maintain CMS consistent with good air pollution control practices, in accordance with manufacturer's specifications for installation, operation and calibration [§63.8(c)(1) -(c)(3)]	• For *thermal oxidizer* install, operate, maintain, and calibrate every 3 months continuous monitor and recorder of combustion zone temperature; accuracy of ±1% of temperature measured or ±1°C, whichever is greater [§63.828(a)(2)(ii) & (a)(4)(I)] • For *catalytic* oxidizer, install, operate, maintain, and calibrate every 3 months continuous monitor and recorder of the catalyst bed inlet temperatures; accuracy of ±1% of temperature measured or ±1°C, whichever is greater [§63.828(a)(2)(ii) & (a)(4)(ii)] • Monitor capture efficiency parameter in accordance with capture efficiency monitoring plan [§63.828(a)(5)]

Table 2-2. SUMMARY OF POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic (WWF) with Oxidizer Control Strategy						
Applicable Requirement	**Example SIP-RACT (all subject sources)** [1]	**Example NSR Requirements** [1]	**NSPS (part 60)**		**MACT (part 63)**	
			Subpart A (General Provisions)	**Subpart FFF**	**Subpart A (General Provisions)**	**Subpart KK**
Recordkeeping	• Oxidizer temperature monitoring data • Manufacturer of oxidizers recommended operation and maintenance procedures • Preventative maintenance and/or malfunction prevention and abatement plan • Maintenance logs for control, capture, and monitoring equipment • Material properties and usage data, source operation data, and calculations to support compliance demonstrations • Performance test results	• Generally, same as SIP-RACT requirements	• Occurrence and duration of any SSM of the affected facility; any malfunction of the control system; or any periods inoperative continuous monitors [§60.7(b)] • Records of all CMS and device measurements, performance evaluations, calibration checks, and adjustments and maintenance performed [§60.7(f)]	• For *thermal* oxidizer, average exhaust gas temperature during the initial test; monitored temperature of the exhaust gas; 3-hour average temperature for periods when the exhaust temperature is more than 28˚C less than the initial test average temperature [§60.584(b)(2)] • For *catalytic* oxidizer, the initial test average catalyst bed upstream and downstream temperature; the monitored upstream/downstream temperature; periods when 3-hour average temperature upstream is more than 28˚C less than the downstream temperature in the initial or less than 80% of the average initial test temperature difference [§60.584(c)(2)] • time periods of affected facility operation when the oxidizer is not in use [§60.584(d)]	• Written SSM plan for the source, control system, and monitoring system [§63.6(e)(3)(v)] • Records showing consistency of actions with SSM plan [§63.6(e)(3)(iii) & §63.10(b)(2)] • Records showing any actions inconsistent with SSM Plan [§63.6(e)(3)(iv)] • Written CMS quality control program [§63.8(d)] • Records of data from CMS measurements, audits, calibrations, and malfunctions [§63.10(b)(2) & §63.10(c)] • Records of all reports and notifications [§63.10(b)] • Records of each applicability determination [§63.10(b)(3)]	• Record of the operating conditions during the initial test including the average of the minimum temperature (exhaust for *thermal* and catalyst bed inlet for *catalytic* oxidizers) [§63.827(d)(2) & (d)(3)] • Monthly records of measurements needed to demonstrate compliance including required parameter monitoring data for both capture system and oxidizer (i.e., temperature) for each 3-hour period and applied material and HAP usage data [§63.829(b)(1)] • As well as items in subpart A

Table 2-2. SUMMARY OF POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic (WWF) with Oxidizer Control Strategy						
Applicable Requirement	**Example SIP-RACT (all subject sources)** [1]	**Example NSR Requirements** [1]	**NSPS (part 60)**		**MACT (part 63)**	
			Subpart A (General Provisions)	**Subpart FFF**	**Subpart A (General Provisions)**	**Subpart KK**
Reporting	• Periodic Compliance Reports • Performance test protocol • Test notification • Test results report • Annual VOC emissions statements	• Generally same as SIP-RACT requirements	• Notification of: commencement of construction, start-up, and CMS performance evaluation [§60.7(a)] • Semiannual excess emissions and monitoring system performance report [§60.7(c) & 7(d)] • Initial performance test report [§60.8(a)] • CMS performance evaluation report for initial performance test [§60.13(b)(2)]	• Performance test data and results [§60.585(a)] • Semiannual reports of recorded drops in oxidizer temperature below specified recordkeeping range [§60.585(b)] • As well as items in subpart A	• Initial notification of standard applicability [§63.9(b)] • SSM plan submittal, if requested [§63.6(e)(3)(v)] • Notification of initial performance test and submittal of site-specific test plan if requested [§63.7(b), 7(c) & 9(e)] • Submittal of test report [§63.7(g)] • Semiannual SSM reports [§63.10(d)(5)(I)] • Reports on operation inconsistencies with SSM plan [§63.6(e)(3)(iv)] • Notification of CMS performance evaluation, submittal of evaluation plan and evaluation results [§63.8(e), 9(g)(1) & 10(e)(2)] • Notification of Compliance Status Report [§63.9(h)] • Semiannual excess emissions and CMS performance report [§63.10(e)(3)]	• Capture Efficiency Monitoring Plan for submittal with the Notification of Compliance Status Report [§63.9(h) & §63.828(a)(5)(I)] • As well as items in subpart A

[1] These columns present examples of typical NSR or SIP provisions.

2.3.2 How Can Printing Equipment be Described in a Title V Permit?

The title V permit application must describe the emissions units in sufficient detail so that you can determine the applicability of all requirements and provide the basis for calculating emissions [see 40 CFR § 70.5]. The permit should then identify the applicable requirements and include sufficient information on emissions units to allow your inspectors to match each individual unit observed during a plant visit with the permit's description for that unit [see 40 CFR § 70.6]. All emissions units observed during an inspection should be either in the site's permit or the insignificant activity list (unless added after permit issuance through a new source construction permit or as an insignificant source). The language identifying the equipment may be for descriptive purposes, i.e., not serve as enforceable in terms of defining source capacities and design limitations, unless specifically required to determine an applicable requirement.

Permit applications can identify each operation with a unique emissions unit number. The applications can include information that identifies the function of the emissions unit, the type of equipment, the manufacturer of the equipment, a model number and/or serial number, raw materials used, finished products produced, the design or maximum hourly throughput and/or production rates, and actual expected annual throughput and or/production rates. If the operation of the unit is associated with an air pollution control device, the application can identify the control device in similar terms (type, function, manufacturer, model number, serial number, flowrate, etc.). For printing, press terms can be included that define the throughput capability of the press. These terms include web width or sheet size, number of stations for applying inks and/or coatings, the maximum line speed (linear feet or sheets per minute) and/or impressions per hour. If the press is vented to a control system, the capture and control device should be included in the description.

Although information from the permit application provides the basis for describing the emissions unit in the permit, the entire description in the permit application need not be repeated in the permit. For printing facilities, example descriptions of printing equipment that might be considered for use in a title V permit are presented below.

- Emissions Unit XX - 8-Station Rotogravure Press located in a permanent total enclosure vented to a Catalytic Oxidizer with a 20,000 standard cubic feet per minute (scfm) capacity.

- Emissions Unit YY - 10-Station Rotogravure Press applying radiation (ultraviolet light) cured inks.

- Emissions Unit ZZ - 6-Station Heatset Web Offset Lithographic Press, with single Dryer vented to 10,000 scfm Thermal Oxidizer.

In each of the above descriptions, the printing technology and the control system are identified. Sufficient information must be provided to the permitting authority in the permit application process so it can determine whether all applicable requirements have been identified and whether the permit contains terms and conditions to assure compliance with such requirements [see generally 40 CFR §§ 70.5 and 70.6]. Again, the key principle is that equipment be described in detail sufficient to be linked to applicable requirements and to allow for identification and confirmation by an inspector.

2.3.3 Insignificant Units and Activities

It is likely that your title V program either generally or specifically identifies the activities it considers "insignificant activities." Such activities generally include activities that are clearly trivial, i.e., emissions units and activities without specific applicable requirements and with extremely small emissions. Owners and operators of printing facilities in some jurisdictions have expended considerable effort justifying that a few units or activities qualify as insignificant for title V purposes. We are aware of confusion relative to the different contexts in which insignificant activities have been defined. Moreover, we believe the term "insignificant activity" has not always been used consistently, and may be subject to differing interpretations between you and source owners or operators. We have provided guidance on addressing insignificant activities in White Paper Number 1 (WPN1) and White Paper Number 2 (WPN2) (EPA, 1995a; EPA, 1996a).

For insignificant activities identified by your part 70 program, unless otherwise stated by your regulations, applicants may exclude from part 70 permit applications information that is not needed to determine: (1) which applicable requirements apply, (2) whether the source is in compliance with applicable requirements, or (3) whether the source is major. If insignificant activities are excluded because they fall below a certain size or production rate, the application must describe any such activities at the source which are included on the insignificant activity list [see 40 CFR 70.5(c) and WPN1]. We suggest that the permit need only list these insignificant activities as a class of activities and update the list at the time of permit renewal (i.e., every 5 years). The list could also be updated if the permit is reopened for another purpose before renewal.

Examples of activities in the printing industry you may consider insignificant which do not require emissions calculations include:

- Propane-powered fork trucks;
- Roof-top heating units;
- Natural-gas consumed in a process (e.g., dryers);
- Aerosol cans;
- Pad printing;
- Emergency generators;
- Pre-press equipment;
  - photoprocessing, typesetting, or imagesetting equipment;
  - proofing systems utilizing water-based, ink jet, dry toner, or dye sublimation or proof press designed to evaluate product quality;

    - platemaking equipment or screen preparation activities utilizing water-based developing solutions;
    - equipment used to make blueprints;
- Cold cleaning manual parts washers with less than 10 square feet of surface area;
- Dry toner or other digital presses that apply water-based inks;
- Substrate finishing activities which involve paper folding, cutting, folding, trimming, die cutting, embossing, foil stamping, drilling, saddle stitching, sewing, perfect binding, vacuum forming or other activities that do not generate VOCs and whose particulate emissions are vented inside the facility;
- Adhesive application activity involving hot melt, extrusion, catalyzed solventless, or water-based adhesives; and
- Pneumatic system for collecting paper/film/paperboard scrap from cutting operations.

CHAPTER 3
MACT STANDARDS PERMITTING

As noted above, a printing facility may be subject to several different applicable requirements. Emissions standards issued under CAA section 112 are applicable requirements for purposes of title V. These standards are commonly referred to as MACT or NESHAP. A printing facility may be subject to one or both of the following NESHAPs, depending on the surface coating processes conducted at the facility:

- 40 CFR part 63, subpart KK, for the Printing and Publishing Industry
- 40 CFR part 63, subpart JJJJ, for the Paper and Other Web Coating Industry

Subpart KK establishes limits on organic HAP emissions from publication rotogravure, product and packaging rotogravure, and WWF printing presses. Subpart JJJJ establishes limits on organic HAP emissions from facilities that operate web-coating lines. Although it is possible for subparts KK and JJJJ to apply to different equipment at the same facility, both rules should not apply to the same piece of equipment.

Printing facilities that include chrome plating operations for preparing cylinders may also be subject to the NESHAP for hard and decorative chromium electroplating and chromium anodizing tanks (40 CFR part 63, subpart N).

This chapter primarily discusses permitting issues for subpart KK. We also have a section devoted to subpart JJJJ. The chapter is organized into four sections:

- Section 3.1 provides an overview of subpart KK;
- Section 3.2 addresses maintaining the compliance flexibility of subpart KK in the title V permit;
- Section 3.3 addresses the interface between subpart KK and the part 63 General Provisions (40 CFR part 63, subpart A);
- Section 3.4 provides information on subpart JJJJ.

3.1 OVERVIEW OF SUBPART KK

3.1.1 What Facilities and Equipment Are Subject to Subpart KK?

Subpart KK applies to any facility that is a major source of HAPs, and that operates publication rotogravure (PR), product and packaging rotogravure (PPR), or WWF printing presses [40 CFR § 63.820(a)]. Section 112(a)(1) of the CAA, 42 USC § 7412(a)(1), defines a "major source" as "any stationary source or group of stationary sources located within a contiguous area and under common control that emits, or has the PTE considering controls, in the aggregate, 10 tons per year (tpy) or more of any [single] HAP, or 25 tpy or more of any combination of HAPs." Thus, for purposes of § 112, "major source" refers to the entire site, not just the presses subject to the MACT standards.

At facilities subject to subpart KK, the standards apply to certain equipment, known in the regulations as "affected sources." There are two types of affected sources designated by 40 CFR § 63.821(a)(1)-(2):

- A PR affected source includes all of the publication rotogravure presses at the facility and all affiliated equipment, including proof presses, cylinder and parts cleaners, ink and solvent mixing and storage equipment, and solvent recovery equipment.

- A PPR or WWF affected source includes all of the product and packaging rotogravure and WWF printing presses at the facility.

In accordance with 40 CFR § 63.821(a)(3), the facility has the option of including "stand-alone coating equipment" in the PPR or WWF printing affected source, if the coating equipment and at least one press process a common substrate, apply a common "solids-containing material" (e.g., a coating or ink), or use a common air pollution control device to control organic HAP emissions.

In addition, the following sections specify operations to which subpart KK does not apply, or, as noted, has limited applicability:

- Synthetic minor facilities, [see 40 CFR § 63.820(a)(2) - (a)(7)],
- Research or lab equipment, [see 40 CFR § 63.820(b)],
- PR and WWF proof presses, [see 40 CFR § 63.821(a)(2)(i)],
- "Ancillary" printing, [see 40 CFR § 63.821(a)(2)(ii)] (limited applicability), and
- "Incidental" printing, [see 40 CFR § 63.821(b)] (limited applicability).

3.1.2 What Are the Applicable Requirements of Subpart KK?

Subpart KK's applicable requirements generally include HAP emissions limits, monthly compliance demonstration procedures, and operation, maintenance, testing, monitoring, recordkeeping, and reporting requirements. Table 3-1 summarizes the applicable MACT requirements. Subpart KK's requirements are supplemented by the MACT General Provisions of 40 CFR part 63, subpart A, which were developed so that these common provisions would not need to be repeated in every MACT standard. The General Provisions apply to every MACT standard unless they are overridden by the standard, per 40 CFR § 63.1(a). Table 1 of subpart KK summarizes which sections of the General Provisions apply and do not apply to subpart KK.

Table 3-1. Summary of Applicable Requirements for Subpart KK

Applicable Citations		
Subpart KK	Subpart A	Notes
Emissions standards (new and existing sources): Publication rotogravure		
§63.824(b)	none	An affected source must limit organic HAP emissions to ≤8% of the total volatile matter (including water) used each month.
Emissions standards (new and existing sources): Product and packaging rotogravure or wide-web flexographic (WWF) printing		
§63.825(b)	none	An affected source must limit organic HAP emissions for each month to one of the following: (a) ≤5 percent of the organic HAP applied (b) ≤4 percent of the mass of all materials applied (c) ≤20 percent of the mass of solids applied (d) ≤a calculated equivalent allowable mass based on the HAP and solids content of all materials applied
Compliance demonstration requirements		
§63.824 (b)(1)-(3) §63.825 (b)(1)-(10)	none	The facility must demonstrate compliance each month. There are 3 general compliance methods: (a) Capture and control emissions using an add-on control device (b) Use compliant materials (those with a HAP content low enough to achieve compliance without the use of an add-on control device) (c) A combination of methods (a) and (b)
Operation & maintenance (O&M) requirements		
§63.830 (b)(5)	§63.6	Requirements include O&M in a manner consistent with good air pollution control practices at all times, and the development and implementation of a startup/shutdown/malfunction plan (if an add-on control device is used).
Performance test methods and procedures		
§63.827 (b)-(f)	§63.7	Subpart KK gives specific testing requirements, and it is supplemented by the General Provisions requirements.
Monitoring requirements		
§63.828	§63.8	Subpart KK gives specific monitoring requirements, and it is supplemented by the General Provisions requirements.
Recordkeeping requirements		
§63.829 (b)-(f)	§63.10	Subpart KK relies heavily on the General Provisions for recordkeeping requirements, but adds specifics in some areas.
Reporting Requirements		
§63.830(b)	§63.9 §63.10	Subpart KK specifies some requirements, but relies heavily on the General Provisions for notifications and reporting.

Because the requirements of subpart KK and the General Provisions are applicable requirements of the CAA, you must include these requirements in the facility's title V permit, consistent with 40 CFR §§ 70.2 and 70.6(a)(1).

3.2 MAINTAINING COMPLIANCE FLEXIBILITY UNDER SUBPART KK

According to 40 CFR § 63.829(b)(1) of subpart KK, a facility must demonstrate compliance with the applicable HAP emissions limits for each and every month. To provide compliance flexibility, subpart KK includes several procedures for making this monthly compliance demonstration. However, the flexibility built into subpart KK in terms of compliance options may be lost if the facility is "locked into" a single compliance option by its title V permit. As a means to avoid this potential problem, a permittee may apply for a permit that contains several of the subpart KK compliance options. The permit would then identify the compliance options authorized by subpart KK and include alternative terms and conditions for each option.

There are a variety of reasons that a facility may wish to build in the flexibility to switch among compliance options identified in subpart KK without being required to revise its title V permit. For example, a facility may seek this flexibility in the following instances:

- A facility currently uses an add-on control device to comply with subpart KK, but is planning to switch to compliant coatings within the next 5 years (i.e., within the term of its title V permit); or
- A PPR/WWF affected source that uses compliant coatings wishes to be able to switch among the compliance options from month to month depending on the materials it applies (e.g., HAPs $\leq$4% of total materials applied versus $\leq$20% of solids applied).

Appendix C provides a summary of the subpart KK compliance options for a facility that operates WWF presses and uses compliant coatings. Examples of title V permit conditions are also provided for your consideration in the Appendix.

3.3 INTERFACE OF SUBPART KK WITH THE MACT GENERAL PROVISIONS

The purpose of this section is to clarify the relationship between subpart KK and certain portions of the MACT General Provisions. Section 3.3.1 discusses the requirement for a Notification of Compliance Status, while section 3.3.2 discusses the requirement for Semi-Annual Summary Reports. In section 3.3.3, we discuss the applicability of the General Provisions on performance testing to material composition testing.

3.3.1 Who Should Submit a Notification of Compliance Status?

Consistent with 40 CFR § 63.830(b)(3), <u>every</u> facility subject to subpart KK's emissions limits is required to submit a Notification of Compliance Status. The contents of the notification must include the methods that were used to determine compliance, the methods that will be used to determine continuing compliance, the types and quantities of HAPs emitted by the source, a description of the air pollution control equipment (or method) for each emissions point, and a statement as to whether the source has complied with subpart KK [see 40 CFR 63.9(h)(2)]. This is important information that every facility should communicate to you, as intended by subpart KK and the General Provisions. There is no other mechanism under subpart KK or the General Provisions for the facility to transmit this information to you.

The Notification of Compliance Status is to be sent within 60 days following "the completion of the relevant compliance demonstration activity specified in the relevant standard [see 40 CFR § 63.9(h)(2)]." This is interpreted to be the first monthly compliance determination that the facility is able to complete. For facilities using compliance options that do not require performance tests (i.e., facilities using compliant inks and coatings or a liquid-liquid material balance), the Notification of Compliance Status should be postmarked by the date 60 days after the end of the first full calendar month that the facility is subject to subpart KK's emissions limits. For facilities using compliance options that necessitate a performance test, the Notification of Compliance Status should be postmarked by the date 60 days after the performance test is completed (assuming that the performance test is conducted after the compliance date).

Existing facilities not required to conduct a performance test should have submitted the Notification of Compliance Status by the end of August 1999, based on the compliance determination for June 1999 [see 40 CFR §§ 63.826(a) and 63.9(h)(2)].

The General Provisions indicate that the Notification of Compliance Status is to be submitted to the Administrator before the facility has a title V permit and to the permitting authority after the facility obtains its title V permit. However, the General Provisions define "Administrator" to mean the Administrator of the EPA or his or her authorized representative. Pursuant to 40 CFR § 63.2, the authorized representative can be a State that has been delegated the authority to implement the provisions of part 63. Thus, before you have been delegated the authority to implement and enforce subpart KK, the facility should send this notification to our appropriate Regional Office. If the authority to implement the provisions of part 63 has been delegated to you, the facility should send the notification to you and to our appropriate Regional Office. If the entity in your State that receives delegation of subpart KK is different than the designated title V permitting authority, the facility should send the notification to the appropriate agency depending on whether it has received its title V permit when the notification is due.

3.3.2 Who Should Submit Semi-Annual Summary Reports, and When?

Every facility subject to subpart KK's emissions limits is required to submit the semi-annual Summary Reports, according to 40 CFR § 63.830(b)(6). This is the only mechanism within subpart KK and the General Provisions for the transmission of regular reports on a facility's compliance status. If the facility is also subject to title V, this requirement should be contained in the title V permit for the facility, per 40 CFR § 70.6(a)(3)(iii).

Any facility that operates a continuous monitoring system (CMS) - which includes continuous emissions monitoring system (CEMS) and continuous parametric monitoring system (CPMS) - must submit both Summary Reports and, under some circumstances, full Excess Emissions and Monitoring System Performance Reports, consistent with 40 CFR § 63.10(e)(3). In some cases, more frequent reports may be required. You should apply these reporting requirements in a manner appropriate for each monitoring system. For example, do not try to force requirements intended for instrumental monitors onto manual recordkeeping systems.

The reporting period for semi-annual Summary Reports is each calendar half (i.e., reports must address no more than a 6-month period). The schedule for submitting these reports may be based on the 6-month period of January through June and July through December. Alternatively, the source and the State may establish a different, mutually acceptable 6-month reporting period, consistent with 40 CFR § 63.10(a)(5). Each Summary Report is to be postmarked within 30 days following the end of the reporting period, consistent with 40 CFR § 63.10(e)(iii)(5).

In addition, the part 63 General Provisions provide for adjusting the reporting schedule by mutual consent, between you and the facility, if desired [see 40 CFR § 63.9(i)]. If you agree to a change in the reporting schedule, we recommend that the change be phased so that no reports are skipped. That is, there should never be more than 6 months between reports, although there might be one reporting period of less than 6 months during the phase-in.

These reports, like the Notification of Compliance Status discussed above, are to be submitted to the Administrator. This means that until you have received delegation of subpart KK, the facility should send the reports to our appropriate Regional Office. After delegation, the reports should come to you and to our appropriate Regional Office. To determine which States have received delegation of this MACT standard, sources should contact the appropriate Regional Office.

3.4 SUBPART JJJJ

Subpart JJJJ for the Paper and Other Web Coating Industry is a final MACT standard that establishes limits on organic HAP emissions from facilities that operate web-coating lines.

3.4.1 What Facilities and Equipment Are Subject to Subpart JJJJ?

A facility is subject to subpart JJJJ if it is a major source of HAP, and if it operates one or more web-coating lines [see 40 CFR § 63.3290]. Printing presses subject to subpart KK are <u>not</u> generally considered web-coating lines; therefore, no lines should be subject to both subparts. However, a facility could have some lines subject to subpart KK and others subject to subpart JJJJ, and therefore be required to demonstrate compliance with both subparts. In concert with 40 CFR §§ 63.3300(a) - (b), to avoid dual applicability, an owner or operator may include web-coating lines that would otherwise be subject to subpart JJJJ in the subpart KK affected source, and thereby avoid the application of subpart JJJJ.

According to § 63.3300 of subpart JJJJ, the affected source is the collection of all web-coating lines at a facility, except any of the following:

- Any web-coating lines designated as stand-alone coating equipment under subpart KK if that line is included in the subpart KK compliance demonstration;
- Any web coating line that is a product and packaging rotogravure or WWF press which is subject to the Printing and Publishing MACT Standard (regulated under 40 CFR part 63, subpart KK);
- Any web coating line that is subject to the Magnetic Tape Manufacturing MACT Standard (regulated under 40 CFR part 63, subpart EE);
- Any web-coating line that is subject to the Metal Coil Coating MACT Standard (regulated under 40 CFR part 63, subpart SSSS);
- Any web coating line that is subject to the Printing, Coating, and Dyeing of Fabric and Other Textiles MACT Standard (regulated under 40 CFR part 63, subpart OOOO);
- Any web coating line in lithography, screen-printing, letterpress, and narrow-web flexographic printing processes; and
- Any web-coating line used as research or laboratory equipment, for which the primary purpose is to conduct research and development into new processes and products.

In addition, lithographic, screen, letterpress and narrow-web flexographic printing presses are not subject to subpart JJJJ, 40 CFR § 63.3300(c).

3.4.2 What Are the Emissions Limits and Compliance Options for Subpart JJJJ?

An affected source may comply with any of the emissions limits specified in 40 CFR § 63.3320, and summarized in Table 3-2. These limits are in the same format as the emissions limits for PPR/WWF affected sources under subpart KK. For existing sources, the emissions limits are at the same level under subpart JJJJ and subpart KK. Subpart JJJJ includes more stringent limits for new sources, while the limits for new and existing sources are identical under subpart KK.

Table 3-2. Summary of Subpart JJJJ Emissions Limits

	Existing sources must limit the emissions of organic HAP from the affected source to no more than...	New sources must limit emissions of organic HAP from the affected source to no more than...
Option 1	5% of the organic HAP applied for the month	2% of the organic HAP applied for the month
Option 2	4% of the mass of coating materials applied for the month	1.6% of the mass of coating materials applied for the month
Option 3	20% of the mass of solids applied for the month	8% of the mass of solids applied for the month

According to 40 CFR § 63.3370(a), facilities may comply with the emissions limits contained in subpart JJJJ by: (1) capture and control of HAP emissions using an add-on control device, (2) use of compliant coatings, or (3) a combination of add-on control and lower-HAP coatings. Facilities choosing to comply with Option 1 must comply by using a capture system and control device that achieve the required overall control efficiency [§ 63.3370(e)]. Facilities choosing to comply with Option 2 or 3 may comply in one of four ways:

- Using "as-purchased" compliant coatings;
- Using "as-applied" compliant coatings;
- Using "as-applied" coatings that keep HAP emissions below a calculated equivalent allowable mass; or
- Using a combination of lower-HAP coatings and add-on control to achieve an emissions rate equivalent to Option 2 or 3 or a calculated equivalent allowable mass (see 40 CFR § 63.3370(a)(6)].

To ensure practical enforceability, subpart JJJJ also contains provisions for performance tests, monthly compliance demonstrations, monitoring, recordkeeping, and reporting. In addition, the part 63 General Provisions apply to the extent that they are not overridden by subpart JJJJ.

3.4.3 What Is the Compliance Schedule for Subpart JJJJ?

The date on which a web-coating facility must achieve compliance with subpart JJJJ depends on whether it is a new affected source or an existing affected source. The cutoff for this determination is the day that the rule was proposed in the *Federal Register*, which was September 13, 2000. If construction or reconstruction of the affected source began on or before that day, it is an existing affected source; if after, it is a new affected source.

The compliance date for existing sources subject to subpart JJJJ is December 5, 2005. The effective date of the rule is December 4, 2002. New and reconstructed affected sources must comply upon startup or by the effective date, whichever is later.

Under the CAA and our implementing regulations, new standards, such as MACT standards, must be incorporated into existing title V permits within 18 months of the date of promulgation of the standards (if the source is a major source with a remaining permit term of three or more years and the effective date of the standards is later than the date on which the permit is due to expire) [see 42 USC § 502(b)(9) and 40 CFR § 70.7(f)(1)(i)]. If a permit revision does not occur within 18 months, our part 70 regulations provide that the permit shall be reopened for cause and revised [see 40 CFR § 70.7(f)(1)(i)].

Although the Act and our regulations contemplate an 18-month window for incorporating new applicable requirements that apply to a major source with a remaining permit term of 3 or more years, we recommend that sources consider initiating the title V permit revision process earlier, as opposed to later [see 40 CFR §§ 70.5 and 70.7(e)]. If this occurs, it should avoid any need on your part to re-open the permit for cause based on a source's failure to timely incorporate a new standard. In addition, even though a source may not have complete information shortly after the new standard is promulgated, the absence of that information does not necessarily preclude early issuance of the permit incorporating the new standard. For example, shortly after promulgation of a new standard, it is likely that a source may not have decided which of the compliance options outlined in the standard it will implement. In such cases, sources in their permit revision application can identify different compliance options, as specified in the new standard, and seek alternative terms and conditions for each option [see section 3.2]. A permit that includes different compliance options and appropriate terms and conditions provides the source flexibility as it makes compliance decisions consistent with the new standard. Such a permit may also obviate the need for additional permit revisions in the future, but the need for such revisions depends, in large part, on the requirements of the new standard.

CHAPTER 4
MONITORING AND PRACTICAL ENFORCEABILITY

Monitoring is defined by 40 CFR § 63.2 as the "collection and use of measurement data via manual, automatic or instrumental means, including recordkeeping and testing to control the operation of a process or pollution control device or to verify a work practice standard relative to assuring compliance with applicable requirements." It is an essential part of establishing and maintaining compliance with air pollution control requirements. Many questions have arisen concerning the monitoring of VOC emissions in the context of meeting individual applicable requirements related to CAM, PTE limits, SIPs, and MACT subpart KK. We believe the approaches described below may provide useful ideas for implementing the applicable requirements for the facilities in your jurisdiction. Of course, nothing in this TSD shall be construed as limiting the use of any credible evidence to demonstrate compliance or non-compliance, and sources are obligated to consider any credible evidence in their title V compliance determinations [see 62 FR 8313 (February 24, 1997)].

4.1 WHAT MONITORING IS APPROPRIATE UNDER THE CAM RULE?

The CAM rule at 40 CFR part 64 was established to enhance monitoring for certain large emissions units that rely on active control devices to meet applicable requirements and that are subject to rules promulgated prior to November 15, 1990. For those emissions units subject to the CAM rule, the CAM rule has applicable requirements that enable sources to demonstrate compliance with applicable emissions limitations or standards, so the compliance assurance monitoring meets the title V compliance certification requirements. In August 1998, our Emissions Measurement Center (EMC) issued a CAM Technical Guidance Document (TGD), available on our website at http://www.epa.gov/ttn/emc/cam, to describe how to determine whether the CAM rule applies to a source, and, if so, how to select and document monitoring that satisfies CAM requirements.

Examples of CAM protocols are presented in Appendix D for those emissions units at major sources subject to CAM requirements. We believe that in many cases these protocols may serve as the basis for meeting CAM plan requirements. There are three ways in particular that these protocols can be used in your State. First, if they are approved into your SIP, sources can then rely upon the protocols as being presumptively acceptable monitoring for CAM compliance purposes. Second, to the degree that the source is subject to the monitoring required by Federal standards proposed by the Administrator after November 15, 1990, pursuant to §§ 111 or 112 of the Act, or voluntarily adopts such monitoring requirements that apply to the relevant control device of the source, this would also be presumptively acceptable for CAM compliance. Finally, a source may use the monitoring protocols with a separate demonstration of how their alternative monitoring approach would meet the CAM requirements [see 40 CFR §§ 63.8(f)(2) and 60.13(i)]. While individual units may not meet the CAM rule applicability cutoffs for size, or may not be subject to the CAM rule because they are subject to rules promulgated after November 15, 1990, pursuant to 40 CFR § 64.2 (e.g., the Printing and Publishing MACT, the Paper and Other Web Coating MACT), you may find these monitoring approaches useful even when monitoring is required under an applicable requirement. The relevance of the approaches would, of course, depend on the monitoring requirement at issue.

4.2 WHAT MONITORING MAY BE AVAILABLE TO DEMONSTRATE COMPLIANCE WITH A PTE LIMIT?

As discussed in Chapter 2, title V permitting applies to major sources as defined by the CAA title III air toxics requirements or title I nonattainment requirements, based on their PTE [see 42 USC § 7661(2) and 40 CFR §§ 70.2 and 70.3]. Sources subject to a PTE limit must demonstrate that their potential VOC emissions are less than major source thresholds. This demonstration must rely on practicably enforceable limits [see 40 CFR § 70.6(b)]. In developing these limits, we refer you to the following:

1) The June 13, 1989 memorandum entitled "Guidance on Limiting Potential to Emit in New Source Permitting," signed by Terrell E. Hunt, Office of Enforcement and Compliance Monitoring, and John Seitz, Office of Air Quality Planning and Standards (EPA, 1989);

2) The January 25, 1995 memorandum entitled "Options for Limiting the Potential to Emit (PTE) of a Stationary Source Under Section 112 and Title V of the CAA (Act)," memorandum from John S. Seitz, Office of Air Quality Planning and Standards and Robert I. Van Heuvelen, Office of Regulatory Enforcement (EPA, 1995c); and

3) The January 22, 1996 memorandum entitled "Release of Interim Policy on Federal Enforceability of Limitations on Potential to Emit," memorandum from John S. Seitz, Office of Air Quality Planning and Standards and Robert I. Van Heuvelen, Office of Regulatory Enforcement (EPA, 1996b).

These memoranda provide guidance on establishing readily verifiable and enforceable restrictions on PTE. Consistent with the principles of the above guidance, you may consider the following items useful in establishing monitoring provisions that are practical in their enforceability for each applicable requirement:

- The overall monitoring approach;
- The monitoring methods;
- Indicator range (if applicable);
- The monitoring frequency;
- The averaging period;
- Recordkeeping; and
- (quality assurance (QA)/quality control (QC).

We suggest that you review each of the items of the monitoring approach with the facility, prior to permit issuance. For instance, with regard to the monitoring frequency, you may want to establish how the source owner or operator intends to select the value to be reported for each period that data are required. For example, since a thermocouple can provide near instantaneous readings, you may expect to see a myriad of ways to compile the data. One source owner or operator could average all the values obtained during the period while another source owner or operator might provide the lowest value obtained during the period. If an applicable requirement addresses this issue, you would, of course, follow that requirement. Absent a specific applicable requirement, however, we suggest that you and the source owner or operator address, select, and agree on the means to provide this information. Appendix D contains examples of capture and control parametric monitoring approaches for VOC emissions units that are subject to the CAM rule (i.e., those units whose potential uncontrolled VOC emissions are greater than the major source threshold). These protocols may also be used for sources not subject to the CAM rule, but subject to monitoring under minor NSR, provided that the use of such protocols is authorized by the applicable SIP provisions. For non-CAM pollutant specific emissions units such as those subject to minor NSR, but with no existing SIP monitoring, less frequent monitoring (e.g. each shift or daily, rather than continuous) of some parameters (e.g., indicator of capture system flow rate) may be appropriate.

See Table 4-1 for another example of a monitoring approach that may be applicable to a facility you permit. A lithographic printing press is often subject to a PTE limit. Minor NSR requirements can also apply and are typically based on the draft Control Technique Guideline (CTG) for Offset Lithography and Alternative Control Technique (ACT) for Offset Lithography (EPA, 1993a; EPA, 1994). The draft CTG and the ACT were developed by EPA as a basis for State VOC RACT rules for meeting SIP requirements under 40 CFR part 52; several States have formally adopted RACT rules that codify the draft CTG and ACT approaches. The actual approach you may include in the permit may vary and generally will follow the historical monitoring approach taken by the printer to the extent approved by you. Table 4-1 does not contain actual permit language. Rather, the table presents possible approaches for you to consider as you evaluate title V permit applications.

Table 4-1. Example Monitoring Components for a Lithographic Printing Press Subject to a PTE Limit

Component	Example Description or Action
Applicable Requirements	NSR requirements typically based on draft CTG for Offset Lithography and Alternative Control Technique (ACT) for Offset Lithography (EPA 453/R-94-054). Requirements are specific to each facility; they may address: Cleaning Solvents: limit on VOC content *or* composite vapor pressure Fountain Solutions: limits on VOC and/or alcohol content and maximum temperature in fountain VOC Control *for Heatset Litho Units Only*: minimum VOC control device efficiency applied to dryer exhaust (i.e., 90 % or maximum VOC concentration, i.e., 20 ppmv) Emissions: NSR limit on PTE.

Table 4-1 (continued)

Component	Example Description or Action
Monitoring Approach	Determine VOC content or composite vapor pressure for all cleaning solvents. Determine VOC and/or alcohol content for each fountain solution batch formulation. Monitor temperature in the fountain for non-refrigerated fountain solutions. Track usage of all VOC containing materials including fountain solution additives, cleaning solvents, inks, and coatings. *For Heatset Units only* demonstrate capture and control system effectiveness. Monitor control system performance (i.e., oxidizer combustion temperature). Confirm continued capture performance.
Monitoring Methods	Collect material composition data (i.e., CPDS or MSDS or other technical data sheets, formulation data, or test results) for all cleaning solvents, fountain solution additives, inks, coatings and diluent solvents used in appreciable quantities. Absent supplier or formulation data, Method 24 can be used for determining VOC content of inks and coatings but is not recommended for non-ink/coating materials. Method 311 can be used for determining HAP content (see section 5.1). Determine/calculate cleaning solvent VOC content and/or composite vapor pressure. Apply appropriate retention, emissions, and carryover factors where approved (see draft CTG and ACT). Monitor VOC/alcohol content in fountain solution by material balance, refractometer, hydrometer, or other approved method. Monitor temperature in the fountain for non-refrigerated fountain solutions. Collect data at least monthly on the quantities of all materials used. Determine compliance each month using mass balance and the appropriate retention, emissions and carryover factors, and, if applicable, control system effectiveness. *For Heatset Units only*, conduct performance test to demonstrate capture (air flow into dryer) and determine minimum oxidizer temperature that meets minimum destruction efficiency or maximum exhaust VOC concentration. Monitor inlet temperature for catalytic oxidizer or combustion zone temperature for thermal oxidizer. Periodically inspect dryer and ductwork including check with airflow indicator (i.e., smoke tubes, paper/foil strips, or pressure/airflow monitor) to confirm capture conditions are maintained consistent with performance test.
Indicator Range	Compliance terms are generally maximum values not to be exceeded for cleaning agents and fountain solutions including fountain solution temperature. *For Heatset Units only*, minimum operating oxidizer temperature based on performance test.
Data Collection Frequency	Record of each compliance determination for each cleaning solvent used. Record of VOC/alcohol content for each fountain solution batch; may include daily measurement when VOC/alcohol added to fountains during printing. Daily measurement or continuous monitoring of fountain solution temperature. At least monthly accounting of material usage. *For Heatset Units only*, continuous monitoring and recording of oxidizer temperature.
Averaging Period	No averaging required for limits based on maximum or monthly emissions determinations. Minimum oxidizer temperature compliance based on block three-hour averages in comparison to performance test value (test values generally based on average of three one-hour test runs).

Component	Example Description or Action
Recordkeeping	All material usage records and composition data including CPDS, MSDS, formulation data or any Methods 24/311 test data for applied inks and coatings. All compliance determinations for cleaning solvents and fountain solution limits. All monthly emissions determinations and 12-month rolling summations for compliance with any NSR emissions limit on PTE. *For Heatset Units only*, performance test results including demonstrated operating oxidizer temperature. Oxidizer temperature monitoring data. Records of periodic confirmation of capture conditions. *For title V sources*, recordkeeping and reporting of summary information and deviations are to be performed in accordance with State provisions pursuant to 40 CFR § 70.6(a)(3)(ii) and (iii).
QA/QC	Follow manufacturer's recommendations for monitoring equipment used to determine VOC/alcohol content, fountain solution temperature, and, *for Heatset Units only*, oxidizer combustion temperature. Periodic review of data collection, calculation, and recordkeeping procedures. Periodic audit of material composition data including MSDS, CPDS and formulation data. Follow M24/311 procedures when those methods are used. Compliance determinations for each new cleaning solvent. Conduct initial performance test for capture and destruction efficiency. For catalytic oxidizer, periodically conduct analysis of catalyst activity in accordance with manufacturer's recommendations. Periodic control system performance testing may be required by the permitting agency, i.e., every five years.

4.3 HOW CAN MATERIALS MONITORING BE USED TO DEMONSTRATE COMPLIANCE?

Printers and other VOC emitters may be required to demonstrate compliance with VOC and HAP limits by monitoring materials usage and composition. Such requirements may exist in the SIP or an NSR permit. In addition, subpart KK authorizes facilities to show compliance with the relevant limits through materials monitoring [see e.g., 40 CFR § 63.829(b)(1)]. Materials monitoring requirements may apply to different operations, including those relying on compliant input materials, those using control systems, and those demonstrating compliance through a combination of controls and application of specific coating formulations.

The general principles contained in this section are suggestions that we believe may be helpful to you. We have also included examples of these principles. The general principles may be considered to the extent that they are not inconsistent with applicable requirements.

4.3.1 How Does a Printer Monitor or Track Material Consumption?

The printing industry uses a variety of materials including inks, coatings, solvents, and additives to print on a number of substrates, such as paper and paperboard, plastic films, and foils. Each material can have different properties (e.g., VOC content, density, etc.) which should be accounted for in determining emissions. Printers receive and dispense materials from a variety of containers, including pails, drums, totes, and bulk storage vessels. Press utilization is typically tracked by the number of impressions printed, by the press operating rate, and/or by the duration of press operation. Larger facilities generally track production by each individual press.

Printing facilities utilize different approaches to monitor material consumption. Usage of individual materials may be tracked by press and by printing project or job, or by containers issued or consumed, or by changes in periodic inventories. In some facilities, periodic meter readings are used to track bulk material usage. Any one facility may use one or more of these approaches to track material consumption. Certain materials (e.g., inks and overprint varnishes) issued and returned from individual press jobs are generally accounted for by weight. Bulk materials are generally accounted for by volume or weight.

4.3.2 What General Principles Are Relevant To Measuring Material Usage?

If you have a facility that you are permitting that is subject to an applicable requirement that calls for measuring material usage, you may find the following general principles useful:

- **Current practices for measuring usage are acceptable in many situations.** It is likely that in many situations you will be able to incorporate the facility's current practices for measuring material usage into practically enforceable permit terms. For example, subpart KK does not necessarily require new or more rigorous measurement techniques than what facilities have used or are using. Frequent, short-term measurements are not necessarily superior to simpler, broader measurement approaches. In recognition of this principle, subpart KK was broadly structured to allow both types of measurement approaches. Some SIPs and NSR permits may afford the same flexibility.

- **Defining and documenting measurement procedures is important.** We recommend that you and the facility come to a common understanding of the specific measurement procedures (e.g., monitoring methods, indicator range, data collection frequency, averaging period) that the facility intends to use to show compliance with the relevant emissions limit. We also recommend that such understanding be documented. That documentation may occur in the permit itself, the statement of basis, or another document, such as a QA/QC plan, depending on what the applicable requirement provides. For example, where the CAM rule applies, sources may document measurement procedures in a monitoring submittal.

  Another example concerns subpart KK and the General Provisions. Section 63.8(d) of the General Provisions, which applies to subpart KK, requires the source to develop and implement a continuous monitoring system QA/QC program [see 40 CFR §§ 63.824(b)(1), 63.824(b)(2), 63.824(b)(3), or 63.825(b) (describing how to demonstrate continuous compliance with the standards); 63.8(d) (QC program)]. Section 63.8(d) also includes certain minimum elements to be included in the QC program. Those elements reflect the importance of understanding the specific measurement procedures that a facility intends to use to show compliance with the applicable requirements, including the standards. Establishing these procedures as part of a QA/QC plan provides important information for you and the public, and serves as an important reminder to source owners and operators. Appendix E presents an example of the components and contents of a QA/QC plan for a source that tracks material usage for HAP coating operations subject to subpart KK.

- **The margin of compliance may be a relevant factor in approving a measurement approach**. "Margin of compliance" refers to the difference between a facility's emissions limit and actual emissions. The margin of compliance is an appropriate factor to consider when determining what additional data may be needed for compliance purposes [see, for example, 40 CFR § 64.3(c); 67 FR 80186, 80221 (December 31, 2002)]. A large margin of compliance may support a facility proposal to use a less-comprehensive measurement approach, while a narrow margin generally requires a more comprehensive measurement approach. The measurement approach should be accurate enough so that the compliance status for each compliance period is clearly known. The margin of compliance also bears on the level of QA/QC that is necessary. A wide compliance margin may call for less rigorous QA/QC. Tighter QA/QC is appropriate where the compliance margin is slim.

- **Material usage measurements may be minimized to the level necessary to demonstrate compliance**. The facility need not perform material usage measurements in excess of those necessary to demonstrate compliance, provided that the facility meets all applicable requirements. For example, a number of HAP limitations, such as those contained in the metal coil surface coating and paper and other web coating MACT rules at 40 CFR §§ 63.5170(b)(2) and 63.3370(c)(3), respectively, allow a facility to comply based on a weighted average of the HAP content of the materials used over each compliance period. Normally, a facility will comply by tracking the amount of each HAP-containing material used and the HAP content of each. However, for a facility that uses many materials, only a few of which may exceed the limit, it may be unnecessarily burdensome to track the usage of <u>all</u> these materials. Consistent with our authority to approve alternative monitoring approaches under 40 CFR §§ 63.8(f)(2) and 60.13(i), you and the facility may want to consider the following approach: The facility could track a small number of materials to demonstrate that any usage of materials with HAP content above the limit is offset by usage of materials with HAP content below the limit. For the rest of the materials used during the compliance period, the facility could document that the HAP content was below the limit, without the need to track usage. This offset approach could assure compliance with an average HAP limit, while minimizing the accounting paperwork. Of course, any such approach must comply with all applicable requirements, including any requirement to track usage for emissions inventory reporting.

- **Account for all periods when emissions occur**. Printers and other VOC emitters may be subject to requirements, such as subpart KK, that require continuous compliance with emissions limits. The applicable requirement will generally provide options on how to demonstrate continuous compliance, such as authorizing use of a CEMS or through monitoring material usage [see, for example, subpart KK]. There is always a possibility that the primary monitoring system on which the source relies to demonstrate continuous compliance could malfunction or fail. We therefore recommend that you consider discussing with sources the possibility of including a back-up mechanism in the permit to ensure that the source can demonstrate continuous compliance should the primary monitoring system malfunction or fail.

- **A deviation may not always be a violation**. Whether and to what extent a deviation constitutes noncompliance depends on your individual state statutory and regulatory authority. Although a deviation may not always constitute noncompliance, part 70 highlights the importance of specifically stating your understanding of what constitutes a deviation in the title V permit. Section 70.6(a)(6)(i) requires the permittee to comply with "all conditions of the part 70 permit," and states that "any permit noncompliance constitutes a violation of the [Clean Air] Act and is grounds for enforcement action."

  In addition, each title V permit should include provisions that require ongoing, as well as "prompt," reporting of all deviations, in accordance with 40 CFR § 70.6(a)(3)(iii)(B). All deviations are to be reported according to the timelines established in your operating permit program or the relevant applicable standard, whichever is more stringent. For example, a printer's failure to conduct a weekly inspection as required by permit conditions must be reported and certified as a deviation from the permit but, in general, would not necessarily also indicate, by itself, an emissions limit was exceeded. You and other permitting authorities make these kind of determinations for sources in your jurisdiction in accordance with your enforcement authorities.

  You should make the correct determination for your particular jurisdiction based on the facts and circumstances at issue. You should also note that where 40 CFR part 71 applies, a deviation occurs in:

  > ". . . any situation in which an emissions unit fails to meet a permit term or condition. A deviation is not always a violation. A deviation can be determined by observation or through review of data obtained from title V testing, monitoring, or recordkeeping. For a situation lasting more than 24 hours which constitutes a deviation, each 24-hour period is considered a separate deviation. Included in the meaning of deviation are any of the following [see 40 CFR § 71.6(a)(3)(iii)(c)]:
  >
  > (1) A situation where emissions exceed an emissions limitation or standard;
  >
  > (2) A situation where process or emissions control device parameter values indicate that an emissions limitation or standard has not been met;

(3) A situation in which observations or data collected demonstrates noncompliance with an emissions limitation or standard or any work practice or operating condition required by the permit;

(4) A situation in which an exceedance or an excursion, as defined in part 64 of this chapter, occurs."

Consistent with the above principles, examples of the kinds of provisions that may appear in a permit section addressing monitoring materials use under two separate MACT compliance options are presented below. Table 4-2 provides an example monitoring approach for a wide web flexographic press using compliant coatings to meet subpart KK HAP emissions limits. Table 4-3 provides an example of a publication rotogravure source complying with subpart KK, using a monthly liquid-liquid mass balance (i.e., controlled with a solvent recovery device). It should be noted that the examples provided in Tables 4-2 and 4-3 address only subpart KK. Other applicable requirements, such as RACT rules, NSR permit limits, and VOC emissions caps should be addressed separately. Where you choose to streamline applicable requirements, the monitoring must support the streamlined limit, in accordance with 40 CFR § 70.6(a)(3)(i)(A). As mentioned earlier, the following examples are not intended to represent actual permit language. Instead, the examples are merely illustrative and present possible approaches for you to consider as you evaluate title V permit applications.

Table 4-2. Example Monitoring Components for Subpart KK HAP Limits - Wide Web Flexographic Press Using Compliant Coatings

Component	Example Description or Action
Applicable Requirement	40 CFR part 63, subpart KK limit on organic HAP emissions from product and packaging rotogravure or WWF printing presses [40 CFR § 63.825(b)]
Overall Monitoring Approach	Collect data for each month on the amount of each material purchased and applied on the WWF press and on the HAP content of each material. Determine compliance from these data for each month using one of six options in subpart KK [40 CFR §§ 63.825(b)(1)-(6)].
Monitoring Methods	Collect data on current inventory of materials in storage at the facility. Collect purchase records for the facility. Collect data on HAP and solids content (such as certified product data sheets [CPDS], MSDS, or equivalent from the supplier, or test data) for each material. Retain data on HAP and solids content for at least 5 years [see 40 CFR § 63.10(b)]. Determine compliance for each month using any of six compliance options in 40 CFR §§ 63.825(b)(1) through (6). *We recommend that any method relied on to make decisions concerning compliance should be incorporated into the permit as a permit term or condition or specifically referred to in the permit and attached as part of the QA/QC plan.*
Indicator Range	Not applicable; compliance determined directly for each month by one of the six compliant coating compliance options in 40 CFR §§ 63.825(b)(1) through (6). *We recommend that the specific method used should be identified in the permit.*
Data Collection Frequency	At least monthly in accordance with 40 CFR § 63.825(b).
Averaging Period	Monthly for compliance options in 40 CFR §§ 63.825(b)(2) through (5). *Again, note that we recommend the specific method used be identified in the permit. Also note that the compliant coating compliance options in 40 CFR §§ 63.825(b)(1) requires a compliance determination each month, but does not involve averaging.*
Recordkeeping	All materials usage measurements (including inventory data and purchase records), all materials composition data (including M24/311 data and/or CPDS or equivalent from suppliers), and documentation of all calculations and results. Perform record retention and reporting of summary information and deviations pursuant to 40 CFR § 63.10(b).
QA/QC	Review data collection, calculation, and recordkeeping procedures every six months. Perform Method 24/311 QA/QC procedures if those methods are used [see 40 CFR § 63.8(d)].

Table 4-3. Example Monitoring Components for Subpart KK HAP Limits – Publication Rotogravure Source Complying by Monthly Liquid-Liquid Mass Balance

Component	Example Description or Action
Applicable Requirement	40 CFR part 63, subpart KK limit on HAP emissions from a publication rotogravure source using a solvent recovery device and monthly liquid-liquid mass balance [§ 63.824(b)(1)].
General Monitoring Approach	Collect data to support monthly liquid-liquid mass balance equation in accordance with 40 CFR § 63.824(b)(1)(i).
Monitoring Methods/Plan	Collect data on the mass of each material used for the affected source, including all of the publication rotogravure presses and all affiliated equipment, including proof presses, cylinder and parts cleaners, ink and solvent mixing and storage equipment, and solvent recovery equipment at a facility, Collect data on organic HAP content (such as CPDS, MSDS, or equivalent from the supplier, or test data) of each material, and the amount of volatile matter recovered for the month in accordance with 40 CFR § 63.824(b)(1)(i)(A) through (C). Retain data on HAP and volatile matter content and volatile matter recovered in a permanent file [40 CFR § 63.10(b)]. Determine compliance for each month using the compliance method in 40 CFR § 63.824(b)(1)(i)(D) through (G).
Indicator Range	Not applicable; compliance determined directly for each month by the liquid-liquid mass balance approach in 40 CFR § 63.824(b)(1)(i).
Data Collection Frequency	At least monthly in accordance with 40 CFR § 63.824(b)(1)(i).
Averaging Period	Monthly in accordance with 40 CFR § 63.824(b)(1)(i).
Recordkeeping	All materials usage measurements, all materials composition data (including M24/311 data, formulation data, and/or CPDS/MSDS from suppliers), all volatile matter recovery data, and documentation of all calculations and results. Record retention and reporting of summary information and deviations are to be performed pursuant to 40 CFR § 63.10(b).
QA/QC	Periodic review of data collection, calculation, and recordkeeping procedures. M24A/311 QA/QC procedures if those methods are used. Annual calibration of measurement unit (e.g., mass or volume meter) used to determine amount of volatile matter recovered [see 40 CFR § 63.8(d)]. No specific material testing required other than that specified in accordance with 40 CFR § 63.827(b) and (c); i.e., M311 for HAPs and M24A for VOC.

4.4 WHAT MAY BE APPROPRIATE OPACITY MONITORING FOR CLEAN FUEL COMBUSTION?

We recognize that opacity monitoring requirements vary significantly across the country, based on the authorities and requirements of different SIP programs. One case which often appears to be treated differently involves opacity monitoring requirements for clean fuel combustion. Clean fuels, such as natural gas or propane, have little or no potential to contribute to VE or particulate matter emissions when combusted properly. We have generally found that records of clean fuel usage can be used to demonstrate compliance with opacity as well as particulate matter standards, but of course this depends on the specific provisions of your SIP. Subpart KK allows facility owners or operators to propose alternative monitoring approaches to any monitoring methods or procedures set forth in subpart KK as long as it is done in accordance with 40 CFR §§ 63.8(f)(2) [see also 40 CFR § 60.13(i)]. If a source proposes alternative monitoring approaches for opacity monitoring and you can consider those alternatives consistent with your SIP, you may want to consider whether the stringency of the opacity monitoring approach should be based on consideration of each emissions unit's potential to cause VE, which is a subset of particulate matter emissions.

For sources using back-up fuels that have the potential to contribute to VE or particulate emissions, we believe that opacity monitoring should be required during time periods when these fuels are combusted.

4.5 SPECIFIC ISSUES RELATED TO MONITORING UNDER SUBPART KK

This section addresses certain specific subpart KK monitoring issues. Section 4.5.1 addresses CPMS used to demonstrate ongoing compliance and section 4.5.2 addresses CEMS compliance options.

4.5.1 What Are Recommendations for Continuous Parameter Monitoring Systems for Subpart KK?

This section discusses the relationship between the MACT General Provisions and subpart KK-specific requirements concerning monitoring. CPMS include the temperature monitors and capture system monitors required under some subpart KK compliance options. CPMS are defined along with CEMS and COMS in the General Provisions as CMS. The General Provisions also include provisions for CMS installation, operation, QC, performance evaluation, recordkeeping, and reporting. According to Table 1 of subpart KK, most of these CMS provisions apply to subpart KK.

A number of the General Provisions governing CMS were written with CEMS or COMS in mind, with the result that it is sometimes practically difficult to apply them directly to CPMS. Compliance demonstrations based on continuous monitoring of parameters are allowed under 40 CFR §§ 60.834 and 60.835. Accordingly, you should apply the General Provisions to CPMS in light of the following principles:

- All the elements of a complete monitoring program that are included in the General Provisions are applicable to CPMS.

- It may be practically difficult to comply with some of the specific requirements included in the General Provisions. For example, initial and subsequent calibration information is not relevant for persons who collect and record data manually, rather than with instruments. Likewise, determining and adjusting calibration drift for instruments is not relevant for persons who collect and record data manually.

The General Provisions also include a requirement for a QC program [see 40 CFR § 63.8(d)]. That requirement applies to subpart KK. To ensure that the QC program is well thought-out and complete and that you and the facility have a common understanding of what the facility is required to do, we suggest that you have the facility include the following characteristics in its QA/QC program [see 40 CFR§ 63.8(d)]:

- The indicator(s) of performance - i.e., the parameter, such as temperature, that will be monitored;
- The measurement technique(s) - including detector type, location, and installation specifications; inspection procedures; and QA/QC measures;
- The monitoring frequency;
- The averaging time;
- The definition of out-of-control periods; and
- The sequence of events that the source owner or operator will conduct should an out-of-control period occur.

Some of the above elements are addressed in section 4.3.2. We encourage you and the source owner or operator to be comfortable with the QC program.

We are currently developing performance specifications and QA/QC requirements for common types of CPMS. We have included draft performance specifications and QA/QC requirements in Figures 4-1 and 4-2. The Agency has not yet finalized these specifications and requirements, and therefore we are providing them only for your information.

Figure 4-1 summarizes subpart KK specifications and requirements, as well as suggests QC program characteristics for temperature monitoring devices. For temperature monitoring devices on oxidizers, subpart KK includes specific requirements for some of the elements that should be addressed. These specific requirements include accuracy specifications, location of the temperature sensor, and calibration frequency for data recorders [see 40 CFR §§ 63.828(a)(2)(ii) and (a)(4)]. Other characteristics may be important for a complete understanding of the QC program required under § 63.8(d). Figure 4-2 summarizes characteristics that may be appropriate for a good understanding of the QC program required under 40 CFR § 63.8(d) with respect to pressure monitoring devices for facilities that are required to monitor a capture efficiency parameter.

TEMPERATURE MONITORING DEVICES

Temperature can be measured using devices such as thermocouples, resistance temperature detectors (RTDs), and Infrared (IR) thermometers. Requirements for temperature monitoring devices include the following:

(1) Collect and record at least one temperature reading every 15 minutes while the process operates.
(2) Locate the temperature sensor in the combustion chamber for noncatalytic oxidizers, and at the inlet to the catalyst bed for catalytic oxidizers.
(3) Use a temperature sensor with a minimum measurement accuracy of 1 degrees Celsius or 1% of the temperature value, whichever is greater.
(4) Perform an initial calibration according to the procedures in the manufacturer's owners manual, and then conduct an initial temperature sensor validation check. Validation checks, both initial or ongoing, include comparisons to redundant sensors, comparisons to calibrated measurement devices, or separate sensor and system checks by electronic simulation.
(5) Conduct calibrations at least annually and validation checks quarterly.
(6) Perform quarterly visual inspections of all components if redundant sensors are not used.
(7) Record the results of the inspections, calibrations, and validation checks in a log.
(8) Determine the 3-hour block average of all recorded temperature readings.

Figure 4-1. Example permit conditions for temperature monitoring devices.

PRESSURE MONITORING DEVICES

Pressure can be measured using devices such as manometers, gauges, and transducers (including strain gauges). Requirements for pressure monitoring devices include the following:

(1) Collect and record at least one pressure reading every 15 minutes while the process operates.
(2) Locate the pressure sensor(s) so that a representative pressure is provided.
(3) Use a device with a minimum measurement accuracy of 0.5 inch of water or a device with a minimum measurement accuracy of 5 percent of the pressure range.
(4) Conduct an initial calibration according to the manufacturer's requirements, and then conduct an initial pressure sensor check. Calibration will vary depending on the type of pressure monitoring device used.
(5) Conduct calibrations at least annually and validation checks quarterly and following 24-hour excursions.
(6) Perform at least quarterly visual inspections if redundant sensors are not used.
(7) Record the results of the inspections and checks in a log.
(8) Determine the 3-hour block average of all recorded pressure readings.

Figure 4-2. Example permit conditions for pressure monitoring devices.

4.5.2 What Is Our Interpretation of Subpart KK's CEMS Compliance Options?

This section discusses the subpart KK compliance options that rely on the use of CEMS. The CEMS compliance options require the facility to determine the mass flow rate of total organic volatile matter at the inlet and outlet of the control device [see 40 CFR §§ 63.824(b)(1)(ii) and 63.825(c)(2)(iii)]. Generally, a monitoring system for mass flow rate includes a monitor for the concentration of organic volatile matter and a monitor for the volumetric flow rate of the gas stream. The monitoring section of subpart KK, however, only discusses the CEMS for organic volatile matter concentration [see 40 CFR §§ 63.828(a)(2)(i) and (a)(3)].

Facilities that select the CEMS compliance option in subpart KK are required to operate monitoring systems such that mass emissions, which are the product of pollutant concentration and volumetric (air) flow rate, at the inlet and outlet of the control device (and, therefore, control device efficiency) can be determined for each month [see 40 CFR 63.824(b)(1)(ii)(A)]. The volumetric flow that reaches the control device typically varies over time as print stations and presses come on- and off-line. For this reason, volumetric flow rate monitoring is needed to accurately calculate control device efficiency over each month. For a solvent recovery device, the instantaneous inlet and outlet flow rates may be identical. The inlet or outlet flow rate value may be used to represent both inlet and outlet flow for each time period. Thus, you may want to consider approving single-point volumetric flow rate monitoring under Subpart KK provided that the facility can demonstrate that flow is constant across the solvent recovery device and that the facility implements a good operation and maintenance (O&M) program to detect and repair any leaks in the system, as those leaks could shift the flow rate from constant to variable.

For a facility using an oxidizer, volumetric flow rate should be monitored at both the inlet and the outlet of the oxidizer. This will be necessary if external combustion or dilution air is introduced to the system, which causes a differential between the inlet and outlet flow rate.

In situations where your rules or the applicable requirements cause the facility to monitor volumetric flow rate, we recommend the use of Performance Specification 6 (PS6) of 40 CFR part 60, appendix B, "Specifications and Test Procedures for Continuous Emission Rate Monitoring Systems in Stationary Sources." As you may recall, we use performance specifications to ensure that instruments used to calculate emissions are able to meet minimum criteria. Should you allow the use of PS6, you may also consider allowing the use of appendix F of 40 CFR part 60 for long term QA/QC.

Both Performance Specification 6 and Performance Specification 8 - which establishes minimum criteria for instruments measuring VOC on a continuous basis, can be found in 40 CFR part 60, appendix B, and may be used if the source owner or operator chooses VOC CEMS for compliance purposes - rely in part on the "span value" specified in the applicable subpart. Since subpart KK does not specify a span value, to understand the QC program required by 40 CFR § 63.8(d), the facility should propose a span value for each monitor. Based on our experience, we recommend that you consider a span value of about 1.5 to 2 times the maximum level expected at the point that is being monitored.

CHAPTER 5
TESTING REQUIREMENTS

Chapter 5 describes several issues associated with testing requirements incorporated into title V permits for printers and other types of VOC emitters. Test methods for determining material composition or measuring emissions must be consistent with all applicable requirements. Some applicable requirements addressing testing give facilities flexibility in, for example, deciding which test method to use. To the extent the applicable requirement provides flexibility, we recommend that you base your decisions concerning testing on an understanding of each testing methodology relative to the materials in use and operating conditions.

It should be noted that some of the approaches presented in this chapter are associated with CTG and ACT documents prepared for the printing industry by EPA. These CTGs were developed as a basis for State VOC RACT rules to meet SIP requirements under 40 CFR part 52. Many States subsequently adopted RACT rules that codify the approaches outlined in these documents. RACT for rotogravure and flexographic presses was described in the November 1978 CTG, “Volume VII: Graphic Arts – Rotogravure and Flexography,” (EPA, 1978). For lithographic printing, RACT requirements have been based on a September 1993 Draft CTG for Offset Lithographic Printing (EPA, 1993a) and the June 1994 ACT for Offset Lithography Printing (EPA, 1994). In addition, often, NSR permits include provisions based on our CTG and ACT documents for the printing industry.

5.1 WHAT ARE SOURCES OF MATERIAL COMPOSITION DATA?

Printers need VOC and HAP content data on all consumed materials in order to quantify their emissions. Printers subject to subpart KK must determine the composition of each material by testing or by formulation data [see 40 CFR §§ 63.827(b)(1) - (2) and 63.827(c)(1) - (3)]. Printers may also be subject to SIPs and NSR permits that contain similar requirements.

Testing consists of laboratory measurements that use a recognized methodology, such as through Method 24 or 24A tests for VOCs and Method 311 for HAPs, or an alternative technique that has been approved by the Administrator [see 40 CFR part 60M, Appendix A (for test methods)]. Both subpart KK and subpart JJJJ allow M24 and/or 24A to be used in lieu of M311. As described in section 5.2, below, M24 and M24A may not be appropriate for all input materials used in printing. Formulation data are data based on mixtures of known quantities of materials with known compositions determined by testing or formulation data. For example, formulation data would be reported when mixing a known quantity of a pure solvent with a known quantity of a second material whose VOC composition was determined by testing. The testing and/or formulation data may be provided by suppliers of these materials or determined by the printer through his own testing or monitoring of formulations. Testing may also be conducted by a third party laboratory or contractor.

Many printers rely on their suppliers to provide testing and/or formulation data. Suppliers provide these data through certified product data sheets (CPDS), sometimes called "EPA VOC Data Sheets;" material safety data sheets (MSDS) (required by the Occupational Safety and Health Administration's [OSHA] Hazard Communication Program); or other technical data formats that identify the appropriate data on material properties and composition. Under subpart KK, certain printers using a control device to comply with the standards must conduct initial performance testing [see 40 CFR 63.827]. Such printers may rely on formulation data provided by the supplier if that information, as provided on a CPDS, includes the items described in 40 CFR 63.827(b)(1)(iii). To the extent a SIP calls for analysis of composition data, you may want to consider CPDS, MSDS or other technical data formats provided by the supplier if those documents provide sufficient information to enable you to calculate emissions and determine compliance and if the documents are consistent with the SIP requirements.

If an MSDS shows a VOC or HAP content range for an individual component or for the total of all components, it may be acceptable for the owner or operator to use either the high end of the range as the VOC or HAP content, to contact the vendor to obtain the specific content, to test the material using M24, to test the material using M311, or in the case of solvent-borne inks and related coatings used in publication rotogravure, to test the material using M24A. See section 2.1.2 for a discussion on the definition of VOC and HAP.

Regardless of the source and quality of the data used by the printer, if you are a delegated authority you retain the right to require material testing by the facility, and to collect samples, and to have tests conducted as needed to verify compliance [see 42 USC § 7414(a)(1) and 40 CFR § 63.7(a)(3)].

5.2 WHAT ARE THE ISSUES CONCERNING THE USE OF M24 AND M24A WITHIN THE PRINTING INDUSTRY?

Method 24 and M24A are the two test methods used by the printing industry to determine the VOC content of materials. Within this section we address the following issues related to the applicability of M24 and M24A:

- For what printing materials does M24 and M24A apply?
- How can M24 be adjusted for high water content coatings and inks?
- How do you determine the VOC content of thin-film radiation cured coatings and non-ink and coating printing products?
- What is the relationship between material composition testing under subpart KK and the MACT rule general provisions on performance testing?

5.2.1 For What Printing Materials Does M24 and M24A Apply?

Method 24 is used to determine the elements needed to calculate the VOC content of paints, inks, varnishes, lacquers, or related surface coatings. Method 24 may not be appropriate for determining the VOC content of other types of materials (e.g, cleaners, fountain solutions and screen reclamation materials); however, it may be helpful in characterizing other aspects of these materials (e.g., density, water content and exempt solvent content).

Method 24A only applies to solvent-borne inks and related coatings used in the publication rotogravure industry. Industry has commented that M24A has been erroneously included in permits for lithographic, screen printing, flexographic and product/packaging rotogravure printing operations as the compliance demonstration method for inks and coatings due in large part to the inclusion of the word "ink" in its original title. To clarify the use of these two testing methodologies within the printing industry, a *Federal Register* notice containing corrections was published on October 17, 2000 (65 FR 62043). This notice revised the title and scope of the method to clarify that M24A only applies to solvent-borne publication rotogravure inks and related publication rotogravure coatings. The revised title of M24A is "Determination of Volatile Matter Content and Density of Publication Rotogravure Inks and Related Publication Rotogravure Coatings."

5.2.2 How Can M24 Be Adjusted for High Water Content Coatings and Inks?

Currently, M24 includes a precision adjustment for use when determining the VOC content of waterborne materials (i.e., materials with at least 5 percent water by weight in the volatile fraction). This adjustment is based on confidence limits established for the American Society for Testing and Materials (ASTM) methods referenced in M24 for measuring weight fraction volatile matter content, weight fraction water content, and coating density. In the method, the weight fraction VOC content of waterborne coatings is determined indirectly. The weight fraction VOC of a waterborne coating equals the weight fraction of volatile matter minus the weight fraction water. To express VOC content in pounds of VOC per gallon, the weight fraction VOC is multiplied by the coating density. Because VOC content is determined indirectly, small errors in the measurement of volatile content or water content can result in a relatively large error in the calculated VOC content.

On February 3, 1986, we issued a policy memo, "Jefferson County APCD's Request for an Opinion on the Suitability of M24 and M24A as Enforcement Tools," to provide clarification on how to apply the precision adjustment referenced in M24, and on who should apply the adjustment (EPA, 1986). The memo explains that the primary purpose of the precision adjustment is to safeguard a source owner or source operator from a citation issued in error due to the uncertainty inherent in measuring VOC content of waterborne materials. Consistent with the memorandum, only an enforcement authority - not a source owner, source operator, or supplier - is able to make a precision adjustment for waterborne materials.

The precision adjustment cannot be used when a standard requires that a specific VOC content not be exceeded, and a manufacturer formulates the material to be higher than the specific VOC content limit. In addition, the precision adjustment cannot be used when a printer obtains the VOC content from formulation data provided by the manufacturer.

5.2.3 How is the VOC Content to Be Determined for Thin-Film Radiation Cured Inks and Coatings, and Non-Ink Products, Such as Fountain Solutions and Cleaning Compounds?

NOTE: An ASTM study is underway to answer this question related to thin-film radiation cured inks and coatings. We may issue future guidance following completion of the ASTM study. In the meantime, the following general observations are worth noting.

The majority of radiation cured materials used within the printing industry are thin-film. Method 24 is not intended to be used to determine the VOC content of thin-film radiation cured inks and coatings [see 40 CFR 60, Appendix A, Method 24]. Until appropriate testing methodologies are developed for thin-film radiation cured inks and coatings, you may consider allowing printers using these materials to rely on formulation or supplier data to obtain the VOC content.

Section 11.1 of M24 addresses the method for determining the VOC content of <u>non</u>-thin-film ultraviolet radiation cured coatings by referencing ASTM D-5403 and requiring the curing test described in Note 2 of ASTM D-5403. This is consistent with the approach presented in a 1991 letter from EPA’s Chemicals and Petroleum Branch Chief to the Graphic Arts Technical Foundation in which we recommend the sample of coating be exposed to radiation cure prior to heating consistent with M24 conditions (i.e., 1-hour bake at 110°C) (EPA, 1991).

Cleaning solutions, fountain solutions, and other non-coating materials are also not directly addressed by M24. The testing which established the precision values for the ASTM test methods referenced in M24 only addressed paints, inks, and coatings. Method 24 may not be appropriate for determining the VOC content of other types of materials (e.g., cleaners, fountain solutions and screen reclamation materials); however, parts of M24 may be helpful in characterizing certain aspects of these other materials (e.g., density, water content and exempt solvent content). Until appropriate testing methodologies are developed for non-ink and non-coating printing products, you may consider allowing printers using these materials to rely on formulation or supplier data to obtain the VOC content.

5.2.4 What Is the Relationship Between Material Composition Testing Under Subpart KK and the MACT Rule General Provisions on Performance Testing?

Questions have arisen concerning the application of section 63.7 of the General Provisions and the “Performance Test Methods” provision of Subpart KK, found at 40 CFR § 63.827. The performance test methods provision of Subpart KK specifically includes procedures for determining material composition. We do not intend for the testing that is performed to determine the composition of inks and coatings under Subpart KK to be subject to the requirements such as deadlines for conducting performance tests, advance notification of performance tests, and site-specific test plans, contained in the MACT rule General Provisions at 40 CFR § 63.7 "Performance testing requirements." Those requirements are largely aimed at performance testing of pollution control devices and capture systems, not material composition testing.

We believe you may find the following general principles regarding material composition testing useful:

- Use Existing Data. Facilities are responsible for obtaining composition data that meet the requirements of subpart KK as specified in 40 CFR §§ 63.827(b)(1) - (2) and 63.827(c)(1) - (3). As mentioned in section 5.1, facilities may rely on test or formulation data provided by their suppliers, provided that the data provide a degree of accuracy sufficient to calculate emissions and determine compliance and meets the requirements of 40 CFR 63.827(b)(1)(iii). Of course, facilities remain liable for the actual HAP content of their inks and coatings, regardless of the values provided to them by their suppliers.

- Conduct Testing Using Existing Method. Audit samples of known composition are available for M24 and M311 testing. These are the test methods for determining the volatile matter and solids content of most inks and coatings. You may obtain these audit samples from us and have the testing company analyze them simultaneously with samples of inks or coatings used at the facility. The analysis results from the audit samples provide a check of the testing company's accuracy. For information about obtaining audit samples, visit our Emission Measurement Center web site at http://www.epa.gov/ttn/emc/email.html#audit

- Develop Alternative Test Method. 40 CFR § 63.7(f) outlines the procedures for using alternative test methods for determining material composition.

5.3 ARE NON-LITHOGRAPHIC PROCESSES ELIGIBLE FOR USE OF A RETENTION FACTOR TO ESTIMATE EMISSIONS FROM MANUAL CLEANING ACTIVITIES WHEN USING LOW VAPOR PRESSURE CLEANING SOLVENTS WITH SHOP TOWELS?

Yes, non-lithographic processes are eligible for use of a retention factor to estimate emissions from manual cleaning activities when using low vapor pressure cleaning solvents with shop towels, in accordance with the ACT document for lithographic printing (EPA, 1994). To estimate emissions from cleaning activities, consideration should be given not only to the quantities and VOC content of materials consumed, but also to other factors that characterize the fate of the VOC in the cleaning solvent. For example, for manual cleaning with low vapor pressure cleaning materials, it may be assumed when estimating emissions, that 50 percent of the VOC applied remains in the shop towel after use provided that the cleaning materials and used shop towels are kept in closed containers. As discussed in this section, the application of this

50 percent retention factor is available for all flexographic, rotogravure, letterpress, and screen printing operations.

As a means to reduce VOC emissions from printing facilities, alternative cleaning solvent products have been formulated. The distinguishing characteristic of many of these alternative products is low vapor pressure. We encourage the use of these low vapor pressure products to reduce emissions at the source. We first became aware of low vapor pressure cleaning materials in the context of lithographic printing, and provided a 50 percent retention factor for certain uses of low vapor pressure cleaning materials. Low vapor pressure cleaning materials are now being used by other types of printers. Consistent with our interpretation in the ACT document, we recommend that you consider applying the 50 percent retention factor to manual cleaning with shop towels for all print processes. The following characteristics are relevant to applying this retention factor:

- Use only solvent products with a VOC composite partial vapor pressure of less than 10 mm Hg at 20 degrees Celsius. The composite partial vapor 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:	PP_c	=	VOC composite partial pressure at 20°C, in mm Hg
	W_i	=	Weight percent of the “i”th VOC compound, in grams
	VP_i	=	Vapor pressure of the “i”th VOC compound, in mm Hg
	W_w	=	Weight percent of water in grams
	W_e	=	Weight percent of exempt compound, in grams
	MW_i	=	Molecular weight of the “i”th VOC compound, in grams per gram-mole
	MW_w	=	Molecular weight of water, in grams per gram-mole
	MW_e	=	Molecular weight of exempt compound, in grams per gram-mole

- Solvent products should be used in conjunction with shop towels and cleaning materials and used shop towels should be stored in closed containers.

5.4 UNDER WHAT CONDITIONS CAN METHOD 25A (M25A) BE USED TO DETERMINE THE DESTRUCTION EFFICIENCY OF AN OXIDIZER?

Consistent with 40 CFR subpart KK, M25A can be used for determining the destruction efficiency of an oxidizer (inlet and outlet concentrations) when:

- An exhaust concentration of 50 or less parts per million volume (ppmv) as carbon (C_1) is required to comply with the applicable standard;

- The inlet concentration and the required level of control results in an exhaust concentration of 50 or less ppmv as C_1; or
- The high efficiency of the control device alone results in an exhaust concentration of 50 or less ppmv as C_1.

In situations where M25 is not viable, such as those described in section 1.1 of M25, we allow the use of M25A on both the inlet and outlet (EPA, 1995d) [see 40 CFR § 63.827(d)(1)(vi)].

5.5 WHAT GENERAL PRINCIPLES ARE RELEVANT TO PERFORMING CONTROL DEVICE AND CAPTURE EFFICIENCY TESTING?

The overall control efficiency of a control system is the product of two factors: capture efficiency (the portion of pollutants from the process which is delivered to a control device) and control device efficiency (how well the control device destroys or removes pollutants).

Generally, control device efficiency testing is conducted initially and then repeated on some routine basis or as a result of a specific circumstance. Further, depending on the type of capture system or control device, capture efficiency testing may be conducted initially and may be repeated on some routine basis or as a result of a specific circumstance. Some permitting authorities have developed and implemented their own policies and regulations concerning the frequency of control device efficiency testing (using M18, M25, M25A) and of capture efficiency testing (using M204). Others have not implemented such regulations. For those jurisdictions, we note that although repeat testing may be warranted, there are some circumstances, such as when the configuration of the presses has not changed since the previous test, when repeat testing may not be warranted. Printers are also subject to other federal standards, including, for example, subpart KK, which includes specific requirements on control device and capture efficiency testing. Except where noted, the approaches described below contain general principles relating to control and capture efficiency testing. Several examples of these principles are illustrated below. These principles may be considered to the extent that they are not inconsistent with any applicable requirement.

5.5.1 Control Device Efficiency Testing

5.5.1.1 Initial Control Device Efficiency Testing

For those sources with control devices, we believe a source owner or operator should perform initial control device efficiency testing and collect operating parameter data in order to set the operating parameter value or range of values that demonstrate the control device efficiency is maintained. For subpart KK, 40 CFR §§ 63.827(d) and 63.7(a) require initial control device efficiency testing.

5.5.1.2 Ongoing Control Device Efficiency Testing

As long as a printer does not change operations in a way that could affect control device efficiency, it is likely that the ongoing parameter monitoring, together with good operating, maintenance, and QA/QC procedures will generate data in the operating range(s) that assure compliance with applicable requirements. Therefore, we believe that periodic retesting for control device efficiency - typically once per title V permit term may be sufficient, but this would depend on the applicable requirement at issue.

5.5.2 Initial Capture Efficiency Testing

For those sources with control devices, we believe a source owner or operator should perform initial capture efficiency testing and collect operating parameter data in order to set the operating parameter value or range of values that demonstrate the capture efficiency is maintained.

Subpart KK addresses initial performance testing requirements, including capture testing that you may find instructive. Under subpart KK, the need for and the procedures associated with capture efficiency testing will vary depending upon whether add-on control devices are used and whether the capture system is or is not a permanent total enclosure [see 40 CFR 63.827(e)].

In particular, 40 CFR § 63.827(e) provides that a performance test must be conducted to determine the capture efficiency of each capture system that vents organic emissions to a control device for the purpose of meeting certain requirements of subpart KK. In 40 CFR § 63.827(e)(1), a source owner or operator subject to subpart KK can demonstrate that the capture system is a permanent total enclosure and assume 100 percent capture efficiency by meeting the criteria for permanent total enclosures given in Procedure T - Criteria for and Verification of a Permanent or Temporary Total Enclosure in appendix B to 40 CFR § 52.741. Note the criteria for permanent total enclosures in M204 are essentially the same as those in Procedure T. Consistent with 40 CFR § 63.827(e)(1), any source owner or operator can demonstrate that a capture system is a permanent total enclosure by meeting the criteria given in M204. Also, 40 CFR § 63.827(f) provides that where capture efficiency testing is required, an owner or operator using a control device may, as an alternative to the procedures in § 63.827(e), use any capture efficiency protocol and test methods that satisfy the criteria of either the Data Quality Objective or the Lower Confidence Limit approach described in Appendix A to subpart KK instead of using the test methods prescribed in 40 CFR § 63.827(e).

Moreover, you may find our February 1995 policy memorandum from J. Seitz (EPA, 1995e) and the "Guidelines for Determining Capture Efficiency" (EMC GD-035) (EPA, 1995f)), which include recommended procedures for capture testing, instructive. These procedures are essentially the same as those provided in subpart KK. They include demonstration of a permanent total enclosure, testing with temporary total enclosures or building enclosures, and alternative capture efficiency protocols meeting either the Data Quality Objective or the Lower Confidence Limit approach.

Concurrent with the initial control device efficiency testing, 40 CFR § 63.828(a)(5) requires printers subject to the initial performance test requirement of subpart KK to collect operating parameter data to set the operating parameter value or range of values that demonstrate that capture efficiency is maintained [see 40 CFR § 63.828(a)(5)].

5.5.2.1 Liquid-Liquid Material Balance (LLMB)

For sources which use a liquid-liquid material balance to determine the overall control efficiency of a solvent recovery system, we believe no capture testing is required. In 40 CFR § 63.827(a)(3), for facilities subject to subpart KK, no capture efficiency testing is required when sources use a solvent recovery system as the control device and comply by means of a liquid-liquid material balance to determine the overall control efficiency of a solvent recovery system.

5.5.2.2 Heatset Web Offset Lithographic Printing Presses - Inks and Coatings

For heatset web offset lithographic presses, we believe capture efficiency for VOC (ink oils) from oil-based paste inks and oil-based paste varnishes (coatings) can be demonstrated by showing that the dryer is operating at negative pressure relative to the surrounding pressroom. In the September 1993 draft CTG for Offset Lithography (EPA, 1993b), and a letter written by John Seitz to the Graphic Arts Technical Foundation in 1997 (EPA, 1997), we noted that as long as the dryer is operated at negative pressure, the capture efficiency for VOC from the heatset lithographic inks and varnishes (coatings) formulated with low volatility ink oils can be assumed to be 100 percent of the VOC (ink oils) volatilized in the dryer. Conventional heatset lithographic inks and varnishes are paste-type materials. The VOC in these materials are oils with high boiling points, which volatilize only within the dryer. Some ink oils, nominally 20 percent, are not volatilized and remain in the substrate. If other types (e.g., fluid) of coating materials are used on a heatset lithographic press, then capture efficiency testing is required for the VOC from these other materials.

5.5.2.3 Automatic Blanket Wash Materials and Alcohol Substitutes in Fountain Solution

We addressed values for dryer carryover (capture) of low vapor pressure automatic blanket wash materials and alcohol substitute fountain solution materials used on heatset web offset lithographic presses in the ACT document for lithographic printing (EPA, 1994). Under that guidance, capture efficiency testing is not necessary for the VOC from low vapor pressure automatic blanket wash materials or for alcohol substitutes in fountain solution.

We recommended 40 percent carryover (capture) for low vapor pressure automatic blanket wash materials and 70 percent carryover (capture) for alcohol substitutes in fountain solutions.

5.5.2.4 Presses Without Add-on Control Devices

Most sheetfed and nonheatset web lithographic presses and screen printing presses operate without control devices. These and any other presses operating without control devices would not need to conduct capture efficiency testing, since they do not have control devices. For example, subpart KK provides that the capture efficiency requirements of 40 CFR § 63.827(e) do not apply in the absence of a control device [see 40 CFR § 63.827(e)].

5.5.3 Ongoing Capture Efficiency Testing

5.5.3.1 Permanent Total Enclosure

Provided that the conditions of M204 are shown by ongoing monitoring to continue to be met, the capture efficiency of a permanent total enclosure is assumed to be 100 percent (see M204 at 40 CFR part 51, appendix M).

5.5.3.2 Other than Permanent Total Enclosure

For capture systems that are not permanent total enclosures, as long as the operating parameters continue to be maintained in appropriate ranges, and as long as physical changes to the air distribution system do not occur, we would expect any new capture efficiency testing would show similar results to the initial testing. Accordingly, we suggest that you consider reserving retesting for capture efficiency for those instances where operating parameters indicate that a fundamental change has taken place in the operation or design of the equipment, unless more frequent retesting is required under an applicable requirement. A fundamental change may include any of the following:

- Adding print stations to a press;
- Increasing or decreasing the volumetric flow rate from the dryer (e.g., by changing the size of press fans/motors or removal or derating of dryers); or
- Changing the static duct pressure.

Note that we believe the operating parameter monitoring and recordkeeping approach should also assure the structural and design integrity of the equipment. Approaches such as the ones outlined below may be helpful in providing that assurance:

- Periodic inspection for integrity of all exhaust ductwork associated with affected equipment;
- Periodic preventative maintenance of dryers and ductwork;
- Maintaining duct pressure established during initial capture efficiency test;
- Recording of capture system modifications and equipment changes (e.g., fan motors, fans); and
- Monitoring exhaust system bypass damper(s).

5.5.3.3 Examples

For emissions units at major sources that are subject to the CAM requirements, we refer you to Appendix D, which incorporates some of the principles noted above [see Protocols A through E of Appendix D].

5.6 SPECIFIC ISSUES RELATED TO PERFORMANCE TESTS UNDER SUBPART KK

Section 63.827(d) of subpart KK presents the performance test requirements for determining the destruction efficiency of a control device. We interpret these requirements as follows:

- Section 63.827(d)(1)(v) states that Methods 2, 2A, 3, and 4 of 40 CFR part 60, appendix A are to be performed, as applicable, "at least twice during each test period." We interpret this to mean that the methods are to be performed at least twice during each test run, typically at the beginning and at the end of the run.

- Equation 20 in 40 CFR § 63.827(d)(1)(viii) is used to determine the organic volatile matter mass flow rates at the inlet and outlet of an oxidizer.

  - Equation 20 requires measurements of concentration (C_i) and volumetric flow rate (Q_{sd}) on a dry basis [see the symbol definitions in 40 CFR § 63.822(b)]. Since Method 25A yields concentrations on a wet basis, the data must be transformed using Method 4 to convert to a dry basis.
  - In keeping with recognized mathematical principles, the summation term in Equation 20 reduces to just one organic volatile matter concentration (C_i) and one molecular weight (MW_i) when only one compound in the vent gas exists.

- For determining control device destruction efficiency, the following principles apply:

  - Testing for the mass flow rate of organic volatile matter should be conducted concurrently at the inlet and outlet of the oxidizer in situations where external combustion or dilution air is introduced to the system.

  - The inlet mass flow rate (M_{fi}) and outlet mass flow rate (M_{fo}) should be computed for each test run using Equation 20. These values should be used in Equation 21 [see 40 CFR § 63.827(d)(1)(ix)] to determine the control device destruction efficiency (E) for each test run.

  - The overall control device destruction efficiency for the test should be computed as the mean of the destruction efficiency values from all the test runs.

- Section 63.827(d)(3) specifies the oxidizer operating parameter that is to be monitored to demonstrate continuous compliance, and specifies how the operating parameter limit is to be determined. We interpret this section as follows:

    - The operating parameter to be monitored for oxidizers is temperature. For catalytic oxidizers, the parameter is the gas temperature upstream of the catalyst bed. For other oxidizers, the parameter is the combustion temperature.

    - The operating parameter limit is determined from the continuous parameter monitoring system during the performance test. The limit is computed as the time-weighted average of the temperature values recorded during the test. The facility must maintain the oxidizer at or above this temperature (3-hour averages) to demonstrate continuous compliance.

Sections 63.827(e) and (f), supplemented by appendix A to subpart KK, present the requirements for capture efficiency testing. These sections cite the capture efficiency test procedures of 40 CFR § 52.741, which is the Federal Implementation Plan (FIP) for the Chicago area. Note that since subpart KK was finalized, we have codified the capture efficiency test methods from the Chicago FIP (with minor revisions) at 40 CFR part 51, appendix M, Methods 204 through 204F. The methods are available online from our Emission Measurement Center at http://www.epa.gov/ttn/emc/promgate.html.

The Method 204 series test methods present the methodology for evaluating the various VOC streams needed for determining capture efficiency, but do not discuss how to use the test results to calculate capture efficiency. The cited section of the Chicago FIP or the document *Guidelines for Determining Capture Efficiency* (GD-035, dated January 9, 1995), which is available online in PDF format at http://www.epa.gov/ttn/emc/guidlnd/gd-035.pdf, describes how to calculate capture efficiency. The guideline document discusses recommended capture efficiency testing protocols and acceptable alternative test procedures. Note that capture efficiency testing is not required for sources using a solvent recovery system and liquid-liquid mass balance to verify compliance.

If the facility selects a compliance option that requires a capture efficiency test, continuous monitoring of the capture system will be required, as well [see 40 CFR § 63.828(a)(5)]. Appendix D of this document presents some example capture efficiency monitoring protocols. For purposes of subpart KK, the facility's monitoring protocol should include continuous monitoring of one or more capture system operating parameters to demonstrate ongoing compliance.

5.7 WHAT ARE THE APPROPRIATE PERFORMANCE TEST CONDITIONS?

Compliance testing for VOC and HAP emissions at printing facilities should be conducted under normal or representative operating conditions, in accordance with 40 CFR 60 subpart QQ, §60.433(a)(8); 40 CFR 63 subpart KK, §63.827(d)(1)(vii); the draft CTG for Offset Lithography (EPA, 1993b); and our National Stack Testing Guidance (EPA, 2004). These sections require compliance testing to be conducted under normal or representative operating conditions. We also recognize that a pre-test meeting between the printing facility owner or operator and you may provide a convenient opportunity to define normal, representative operation. During such a meeting, the owner or operator may propose an operating scenario for testing that is representative of actual operating conditions and the VOC/HAP input rate to the control device. Such operating conditions should strive to minimize downtime while running as many presses as practicable, when multiple presses are being served by a common control device. The proposed operating scenario should also be reflective of a typical normal production schedule. As necessary, proposed testing conditions should rely on historical production records for establishing average coverage rates, press speeds, or ink and other input material consumption rates, run times, and average time of intermittent events such as press cleaning, web breaks or similar shutdown situations.

Because activities such as cycling of automatic blanket washing systems, press speed variations, web breaks or other short-term events in which the print quality is being checked, may be a part of normal, representative operations, we recommend that sampling continue during these short-term events while the control device is being tested. All testing conditions should be thoroughly discussed and approved by you prior to the actual test date.

Apart from your ability to require performance tests periodically as needed, we believe that subsequent compliance testing should occur when different operating conditions (e.g., new usage of materials with differing emissions characteristics or new or different equipment or control devices) may adversely affect compliance with the emissions standards. Consistent with our discussion provided in the Portland Cement MACT rule [67 FR 44766 (July 5, 2002)], while a facility is not automatically required to conduct a performance test if the operating conditions vary from those in place during the most recent performance test, the burden is on the facility to demonstrate that it is able to comply with the emission limits when operating under the alternative operating conditions. In other words, the facility has the ultimate burden of persuasion to demonstrate that its performance testing conditions remain representative.

5.8 HOW CAN DESTRUCTION EFFICIENCY REQUIREMENTS BE MET DURING PERIODS WITH LOW CONTROL DEVICE INLET CONCENTRATIONS?

Consistent with the approach taken in the Paper and Other Web Coating MACT, subpart JJJJ at 40 CFR § 63.3320(b)(4), achieving a specified control outlet VOC concentration is recognized as an acceptable alternative to destruction efficiency for demonstrating compliance. The total outlet concentration should be 20 ppmv or less by compound - or as hexane (C_6H_{14}) as a default compound - on a dry basis, coupled with 100% capture efficiency (or operating a heatset web offset dryer at negative pressure to assure ink oil capture), to serve as a surrogate for destruction efficiency. This approach may eliminate the need to conduct extensive destruction efficiency tests by focusing only on VOC outlet concentration. In many situations, VOC outlet concentration is more indicative of overall control device operation. There are several instances where the only option available to the printer is to measure the outlet concentration to demonstrate compliance, such as sources utilizing combined dryers and control devices that do not have an inlet. Also, where there is a consistently low VOC inlet concentration due to light coverage (e.g., book manufacturing), sources may need to utilize this VOC outlet concentration approach.

CHAPTER 6
ADDITIONAL PERMITTING APPROACHES - STREAMLINING PERMIT CONTENT AND MINIMIZING UNNECESSARY PERMIT REVISIONS

6.1 OVERVIEW

Operating permits issued to printing facilities under 40 CFR part 70 must be reviewed every 5 years [see 40 CFR § 70.3(b)(3)(iii)]. In addition, the part 70 regulations provide three different types of modification procedures that may be triggered depending on the nature of the change at the facility [see 40 CFR § 70.3(e) (addressing administrative, minor and significant permit modifications)]. The part 70 regulations further provide that certain changes may be made off-permit [see 40 CFR §§ 70.4(b)(12)-(15)]. In light of these provisions, many plant officials evaluate operations and planning on an ongoing basis and therefore know well in advance whether existing permit terms may constrain the source's ability to make certain plant changes at the facility, and whether a permit revision will be required prior to initiating any plant changes. Planning ahead by facilities is essential to taking advantage of the existing flexibility found in 40 CFR part 70 and the applicable requirements. Permits, by their design, strive to allow a source to make changes as expeditiously as possible under part 70 and the applicable requirement(s) while ensuring that all applicable requirements are enforceable as a practical matter.

Clearly written permits also provide greater certainty to the source, thereby eliminating the need for time-intensive discussions between you and the source and avoiding misunderstandings and the potential for contested enforcement actions. Permits can affirmatively structure the required data collection terms (e.g., testing and monitoring required by the applicable requirements) to provide a clear basis for making annual compliance certifications.

We further believe permits can be structured to reduce unintended permit revision burdens on you and sources and to satisfy the flexibility needs for many sources. Our first two White Papers, which we issued in 1995 and 1996, respectively, describe many permitting techniques that could improve permitting efficiency under title V in several different situations.[1] This chapter suggests some additional approaches you may wish to consider based on 40 CFR part 70 and the guidance provided in the White Papers.

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[1] White Paper for Streamlined Development of part 70 Permit Applications, July 10, 1995 (White Paper Number 1) (EPA, 1995a) and, White Paper Number 2 for Improved Implementation of the part 70 Operating Permits Program, March 5, 1996 (White Paper Number 2).

In the first two White Papers, we described a number of ways to synthesize permit terms. For example, these guidance documents addressed incorporating applicable requirements by reference, insignificant activities and generally-applicable requirements, and "streamlining." As described in section 6.2, when a unit is subject to multiple applicable requirements, you can sometimes streamline those requirements into a single set of permit terms that will assure compliance with all the subsumed applicable requirements.

6.2 STREAMLINING PERMITS FOR PRINTING FACILITIES

Streamlining is a process by which multiple overlapping applicable requirements are distilled into one set of requirements that will assure compliance with all the applicable requirements [see 40 CFR § 70.6 and the second White Paper]. Streamlining may be initiated by either the permit applicant or by you, but ultimately you must choose to authorize it if the permit is to contain streamlining. White Paper Number 2 outlines the streamlining process and explains that you and/or the source would prepare the streamlining analysis during the permit development phase. That analysis would determine whether there is an acceptable streamlining approach that could serve as the basis for establishing a streamlined limit prior to the issuance of the draft permit. The streamlining analysis focuses on identifying and comparing the stringency of all applicable requirements. Streamlining does not relieve the source of its obligation to meet all applicable requirements, but provides a means to identify one set of requirements that, if met, would assure compliance with all applicable requirements. The permit would identify the streamlined set of applicable requirements, as well as the subsumed streamlined requirements. All such requirements are enforceable [see 40 CFR §§ 70.6(a)(1)(i)-(iii) and 70.6(a)(3)(i)(A)]. The permit record should include the basis for the streamlined set of requirements, including streamlining assumptions, calculations, data and any other support [see 40 CFR § 70.6]. White Paper Number 2 includes additional details on streamlining that you and the source should consider in preparing any streamlining analysis.

For title V sources, streamlining has the potential to simplify compliance demonstrations. Through streamlined permit conditions, you can eliminate potential confusion and inconsistencies that may develop when demonstrating compliance when there are multiple overlapping requirements. Streamlining can focus compliance assurance on one set of requirements (i.e., emissions limit, monitoring, recordkeeping, and reporting) that will fulfill all applicable requirements. As shown in Chapter 4, many printing facilities are faced with demonstrating compliance with multiple monitoring or testing applicable requirements, all of which must be incorporated into their title V operating permits [see 40 CFR §§ 70.6(a)(1) and 70.6(a)(3)(A)].

6.2.1 What Principles Govern Streamlining?

This section provides a brief overview of the principles discussed in White Paper 2. In developing streamlined permit conditions, including a streamlined emissions limit, the following principles are relevant:

- **Determine Most Stringent Limit -** Determine the most stringent limit of the multiple emissions limits that apply for the specific regulated air pollutant and emissions unit taking into account the different formats or units of measure, effective dates of compliance, transfer or collection efficiencies, averaging times, and test methods.
- **Combine Pollutants Where Appropriate -** Limitations for specific pollutants may be subsumed by limitations on a broader class of pollutants. Almost all of the organic HAP used and emitted by printers are also VOC, so in some cases VOC limits may suffice for limiting organic HAP. Many of the VOC used and emitted by printers are not HAP, so it is less likely that a HAP limit will suffice for limiting VOC.
- **Include Work Practices -** Work practices that directly support an applicable emissions limit should be considered as part of the limit for purposes of streamlining emissions limits. Work practices that do not can be streamlined separately.
- **Use Monitoring, Recordkeeping, and Reporting for Most Stringent Requirement -** Monitoring, recordkeeping, and reporting should not be used to determine the relative stringency of requirements. The monitoring, recordkeeping, and reporting requirements associated with the most stringent emissions requirement are presumed appropriate for use with the streamlined emissions limit, unless it can be shown that reliance on them would diminish the ability to assure compliance with any limit to the same extent as intended by any applicable requirement, and the monitoring, recordkeeping, and reporting requirements for a subsumed limit would therefore be more appropriate.
- **Provide Origin of Permit Limits -** In the permit, the citations for any subsumed limits must be included as part of the specifications for the permit conditions.

Based on these principles, a side-by side comparison of applicable requirements should be prepared, the most stringent emissions limit identified, and a streamlined set of permit terms and conditions proposed including appropriate monitoring, recordkeeping, and reporting requirements. The source would need to be able to certify compliance with the set of streamlined requirements or, if necessary, commit to a compliance schedule consistent with 40 CFR § 70.6(c).

6.2.2 Overlapping Requirements for Printing Facilities

Many printing facilities have older units subject to RACT regulations based on our CTGs and ACTs. RACT for rotogravure and flexographic presses was described in the November 1978 CTG, “Volume VII: Graphic Arts – Rotogravure and Flexography,” (EPA, 1978). For lithographic printing, RACT requirements have been based on the September 1993 draft CTG for Offset Lithographic Printing and the ACT document for Offset Lithography (EPA, 1993a; EPA, 1994). RACT requirements generally allow for compliance strategies based on capture and control systems or through the use of compliant materials.

Newer units, in addition to complying with RACT, may also be subject to BACT or LAER through a PSD or NSR permit. Some new printing facilities are also subject to NSPS requirements. NSPS apply to publication rotogravure operations [40 CFR part 60 subpart QQ] and vinyl and urethane printing and coating facilities [40 CFR part 60 subpart FFF]. Finally, all new and existing publication rotogravure, product and package rotogravure, and WWF printing facilities are subject to a MACT standard [40 CFR part 63, subpart KK]. The requirements in this MACT standard have the greatest potential to overlap with RACT, NSR, or NSPS requirements. For example, a printer subject to the monitoring requirements of subpart KK for HAPs may also be subject to SIP monitoring requirements to implement RACT as well as the CAM rule for VOC control systems. These requirements are discussed in Chapter 2.

6.2.3 How Do Control Strategies Influence Streamlining?

When assessing streamlining options, you necessarily will consider the applicable limits that apply, including the approach that the printing facility uses to control its emissions. Requirements that apply to capture and control systems may be more conducive to streamlining, and more beneficial in terms of simplification, than streamlining different requirements that define compliant materials. Some issues associated with streamlining for each control approach are described below.

6.2.3.1 Capture and Control Systems

Assessing opportunities for streamlining overlapping requirements for capture and control systems is the most straight forward. You should be able to identify and compare differences in capture and control requirements easily. Control systems are generally equally effective in controlling organic HAPs and controlling VOCs at printing facilities. For example, if there are overlapping requirements for streamlining consideration at certain printing facilities subject to subpart KK, the most stringent requirement is likely to require 100 percent capture and a control efficiency of 95 percent or more. The required destruction efficiency for oxidizers in NSR permits may be more stringent than the 95 percent required by subpart KK. Thus, the NSR control efficiency requirement may dictate the stringency of control in streamlining, not the MACT standard. There may be differences in testing requirements which also should be considered in streamlining.

As with control requirements, streamlining of capture system requirements involves the identification and comparison of both the degree of capture required and the test methods. RACT and NSR requirements may only require a one-time capture test, while facilities subject to the subpart KK MACT standard must continuously monitor and record an operating parameter for capture efficiency.

For control approaches based on oxidizers, control effectiveness is generally based on an initial performance test and parameter monitoring. Compliance is demonstrated by comparing continuous combustion zone temperature monitoring data with temperature data recorded during the most recent performance test. The temperature data serve to indicate whether or not conditions associated with the destruction efficiency determined by the performance test are maintained. The temperature data do <u>not</u> serve to indicate the degree of destruction achieved on a continuous basis. If the temperature monitoring criteria are met, the destruction efficiency from the performance test serves to demonstrate compliance. For each set of applicable requirements, different criteria may exist for conducting the performance test, recording temperature data, and comparing the data on a continuous basis.

For example, typical RACT and NSR requirements generally provide that the performance test be conducted with facilities operating at close to maximum solvent laydown conditions (see Section 5.7, for alternative testing policy. The combustion zone temperature would be recorded under those conditions during the test. The continuous monitoring and recording of temperature data is generally also required under RACT/NSR provisions. The recorded data, usually on strip charts or in a computer file with at least 15 minute values, are then compared to the performance test value.

For packaging rotogravure and wide-web flexographic facilities subject to the subpart KK MACT standard, an initial performance test is required, but under representative operating conditions (rather than maximum) [see 40 CFR § 63.827(d)(1)(vii)]. The test would be conducted such that the minimum temperature would be recorded under which the oxidizer can achieve the required destruction efficiency of 95 percent. Continuous monitoring of the combustion zone temperature is also required, recording at least 15-minute values, and compiled as rolling three hour averages. To demonstrate compliance, the three hour readings must not be lower than the average temperature, as determined during the performance test [see 40 CFR § 63.825].

Both approaches to testing and temperature monitoring are designed to demonstrate that the oxidizer achieves the destruction efficiency conditions established by the performance test. Properly designed and sized oxidizers tend to perform better under high solvent load conditions. Therefore, the subpart KK approach will often be the more stringent monitoring approach compared to the RACT/NSR monitoring requirements.

For solvent recovery systems used to control emissions, RACT, NSR, and MACT requirements generally base compliance demonstration on one of two approaches. Facilities either conduct (1) periodic LLMB around the printing operation including the solvent recovery system , or (2) determine capture efficiency and continuously monitor the solvent recovery system's air flow rate and VOC inlet and VOC outlet concentrations. Both approaches allow for the calculation of recovery system control efficiencies.

For facilities relying on periodic material balances, differences in the frequency or time period for conducting the LLMB may differ between requirements as well as the specificity of data quality requirements for tracking material streams. Subpart KK requires monthly material balances and defines the quality of data to be recorded. For example, subpart KK requires the method used for monitoring the amount of solvent recovered be calibrated within $\mp$2 percent. RACT and NSR requirements typically are not that specific. As a result, the subpart KK procedures for conducting the LLMB will often be the most stringent for printing facilities subject to the MACT.

Facilities may be required by RACT or NSR requirements to conduct LLMBs over shorter time periods than monthly. Shorter time periods are comparatively more stringent than longer periods, i.e., the shorter the time period covered by the LLMB, the more stringent the requirement. Some subpart KK facilities may have RACT/NSR requirements with less stringent control efficiencies, but with LLMB demonstrations required for shorter time periods. Typically, the RACT and NSR requirements for material balances are not specified to this detail in regulations or permits. The longer the time period covered by the LLMB, generally the greater the accuracy in the calculations. The impact of measurement errors are reduced. You should consider based on all of the applicable requirements, which requirement is the more stringent one.

6.2.3.2 Use of Compliant Materials

Streamlining is more difficult for facilities whose compliance strategies are based on use of compliant materials rather than add-on control devices. The difficulties result from trying to structure a streamlining comparison considering requirements which apply to different pollutants, use different units, and use different averaging times. For example, for rotogravure presses, RACT requirements for compliant materials are based on limiting VOC content by volume fraction based on daily averages by press. In contrast, subpart KK offers several compliance options which limit HAP content based on mass fraction determined using monthly averages considering all presses. To compare requirements expressed in different terms, as these are, you may consider converting the relevant terms into a common unit of expression, or if this is not possible, making certain supported assumptions, such as all HAPs will be VOCs. In this regard, you should consider the differences associated with averaging times and press versus facility accounting.

Many States adopted RACT limits for rotogravure and flexographic printing operations based on EPA's CTG for Graphic Arts (Control of Volatile Organic Emissions from Existing Stationary Sources - Volume VIII: Graphic Arts - Rotogravure and Flexography 12/1978). The CTG includes compliant coating limits based on volume-based VOC limits (CTG recommended volume-based limits for applied materials of 75 percent or more water or 25 percent or less VOC). To simplify recordkeeping and compliance determination, a weight-based equivalency of 0.5 pound VOC per pound of ink solids was added to the CTG recommendations ("Alternative Compliance for Graphic Arts RACT," Darryl Tyler, Office of Air Quality Planning and Standards (OAQPS) September 9, 1987 memorandum). States have the option of authorizing the weight-based option on a case-specific basis or by revising their RACT regulation. The use of the weight-based alternative for volume-based RACT requirements may facilitate consideration of streamlining options for compliant coatings. By comparison, in subpart KK, a compliant coating option requires 0.2 pound HAP per pound of ink solids, as a monthly average across the facility.

For some facilities subject to both subpart KK HAP requirements and RACT or NSR requirements for VOC, their compliance strategy may not lend itself to streamlining compliant material requirements. Some facilities use materials with low HAP content and high VOC content. Such a facility may use a compliant material approach to meet the HAP requirements of subpart KK and control equipment to comply with RACT or NSR requirements for VOC. Facilities that use compliant materials to meet RACT/NSR requirements are also likely to meet compliant material requirements for subpart KK for HAPs. Waterborne and/or radiation-cured materials used by printers that comply with VOC limits are not likely to contain appreciable quantities of HAPs.

6.2.4 Streamlining Example

This section provides an example of streamlining that you may consider when permitting a printing facility. The example facility operates a packaging rotogravure press. The press is located in a press room. The press room is vented to an oxidizer. The press installation was authorized through new source review. The press uses solvent based inks, some of the solvents are HAPs. In the title V permit, the facility wishes to streamline three different applicable requirements that apply to the press.

Comparison of Applicable Requirements - The applicable requirements that apply to our example printing facility include the following:

- **State SIP/RACT Requirement for Graphic Arts** - at least 65% overall control of VOC emissions and 90% destruction by oxidizer. Compliance is determined by compliance test using methods in State testing procedures manual. Continuous monitoring of emissions is required in accordance with State monitoring procedures manual.
- **NSR Permit** - 100% capture of emissions based on use of a permanent total enclosure and 96% destruction by oxidizer to control VOC, toluene, and hexane emissions. Initial compliance test is required using Reference Methods including 25/25A. Capture test based on Reference Method 204 is required. Continuous monitoring and recording of combustion zone temperature is also required. Continuous monitoring of capture is based on negative pressure or linear velocity. Daily record must be kept of negative pressure or linear velocity reading. Compliance is determined based on the average hourly temperature data.
- **Subpart KK Requirements** - Facility chose to comply with the standard by operating a capture system and control device and demonstrating an overall organic HAP control efficiency of at least 95 percent for each month [63.825(b)(7)]. Use of oxidizer requires initial compliance test for both capture and control based on Reference Methods including 25/25A and Method T (Method 204) [63.825(d)(1)(i) and (ii)]. Continuous monitoring and recording of oxidizer temperature and a parameter for capture is required [63.825(d)(1)(x)]. Capture monitoring is based on required capture efficiency monitoring plan [63.828(a)(5)]. In this example the facility plan is based on monitoring negative pressure. Compliance is based on the average temperature for each three-hour period [63.825(d)(1)(xi)].

Determine Most Stringent Limit - In this example, the NSR limit and the subpart KK limit are more stringent than the RACT limits. The NSR requirement for 100% capture and 96% control for VOC and the two HAPs is more stringent than the subpart KK requirement for 95% overall control efficiency of HAPs. The test requirements are essentially the same. Maintaining the combustion temperature based on a one-hour average as required by the NSR limit is more stringent than based on a three-hour average under subpart KK.

Hypothetical Streamlined Set of Requirements

The streamlined set of requirements in this example could be:

- 100 percent capture and 96 percent control of VOC and HAP emissions (basis: NSR Permit)
- Initial compliance test for capture and control efficiency using Reference Test Methods (basis: NSR Permit and subpart KK)
- Compliance based on maintaining hourly average of temperature parameter value from performance test (basis: NSR permit)
- Continuous monitoring and recording of permanent total enclosure negative pressure and oxidizer combustion temperature (basis: subpart KK)

Conditions would be drafted for the title V permit that would prescribe the streamlined set of requirements and include citations for each of the applicable requirements streamlined [see 40 CFR § 70.6(a)(1)]. As explained in White Paper Number 2, by meeting the streamlined requirements, all other subsumed applicable requirements would be met.

6.3 EXISTING PERMIT CONDITIONS RESTRICTING OPERATION

Since the 1970's, printing and other facility changes have been subject to NSR permitting requirements in preconstruction review programs for new and modified sources established as part of the SIPs. Permits issued under these provisions of SIPs are federally enforceable. NSR programs dictate that sources demonstrate in advance of major source construction that their capital projects will abide by all applicable air pollution control requirements. The requirements in State NSR programs apply based on the ambient air quality status of the area and the magnitude of the new or modified source relative to established permitting thresholds, generally based on annual potential emissions. Major sources are subject to technology based permitting requirements under §§ 111 (NSPS) and 112 (MACT) and to other permitting requirements under § 110 (BACT in attainment areas) and § 173 (LAER in nonattainment areas).

Changes at sources with potential emissions levels below major source thresholds or changes below the pollutant-specific significance levels at existing major stationary sources are often subject to State minor NSR requirements. Frequently, sources agree to restrictions which limit potential emissions of the source or of the change to below thresholds in order to eliminate applicability of more stringent major source requirements. Where limits are taken to avoid triggering major NSR, a minor NSR permit may include conditions to enforceably limit the source's short-term and annual emissions rate. Some States have technology requirements for minor sources. Both major and minor source permits specify the approved capture and control systems performance levels, and testing, monitoring, recordkeeping, and reporting procedures for demonstrating compliance.

In developing permit terms which have practical enforceability, we refer you to our June 13, 1989 memorandum entitled "Guidance on Limiting Potential to Emit in New Source Permitting," signed by Terrell E. Hunt, Office of Enforcement and Compliance Monitoring, and John Seitz, Office of Air Quality Planning and Standards (EPA, 1989). This guidance was specifically formulated to prevent circumvention of major source NSR, and provides guidance on practical enforceability for many types of purposes. Our guidance stresses the need for readily verifiable and enforceable restrictions on actual emissions as outlined in the Louisiana-Pacific case, United States v. Louisiana - Pacific Corporation, 682 F. Supp. 1122 (D. Colo., October 30, 1987) and 682 F. Supp. 1141 (D. Colo., March 22, 1988). The guidance identifies independently enforceable production and operational limits as the preferred approach to assure the practical enforceability of a PTE limit. The September 2, 1992 memo from John Rasnic, Director, SSCD, OAQPS to David Kee, Director, ARD, R5 further clarified that the production and/or operational limits need not be independently enforceable so long as the limits on VOC usage are supported by adequate recordkeeping and compliance demonstration requirements sufficient to determine [that usage but must be independently evaluated (EPA, 1992a). This guidance further recommends that the time periods for limiting production and operation be as short term as possible. In certain circumstances, we recognized that rolling limits can be used as long as they are no more than yearly, rolled no less frequently than monthly.

The need for operational flexibility has increased significantly for many sectors of U.S. industry, including printers. The global marketplace now requires them to make quick responses to rapidly changing market conditions. A facility may quickly need to begin production of a new product, improve an existing product, shift production from one product to another, alter its manufacturing process, or reformulate its input materials. Often there is a limited window of opportunity, and constraints that prevent or delay such variations in operation can result in significant opportunity costs.

Permit terms and conditions which limit production and/or operation to assure compliance with PTE limits can constrain the operational flexibility of sources, particularly those with highly variable operations. By highly variable, we mean those operations whose VOC emissions are a function of multiple process parameters that often vary, and do so independently. For example, a permit might contain restrictions on the type and amount of materials used. The use of VOC containing materials can also vary significantly over time and across operations and can make hourly or daily accounting of emissions difficult, if not impractical. The summing of multiple short-term measurements can amplify inaccuracies, particularly when small quantities are measured frequently.

The large number of variables impacting material usage and emissions rates associated with printing and certain other VOC emitting operations conveys the clear need in many cases for a flexible approach to ensuring compliance with a PTE limit. Consistent with our prior guidance on PTE enforceability, we believe that there are approaches that you may want to consider during a permit modification process, such as the mass balance formula, as described below, which could replace existing production or related limits, increase operational flexibility and assure environmental protection. To the extent a facility's permit contains production or operational limits included to assure compliance with a PTE limit, any changes to those limits can only occur through the relevant permit process.[2] In subsections 6.3.1 through 6.3.4 below, we discuss constructing a new permit (and modifying an existing permit) consistent with the Agency's guidance on enforceability of PTE limits, while maintaining operational flexibility.

6.3.1 Formula-Based Approaches

Limits on VOC emissions typically can be made enforceable as a practical matter. Where technically feasible, we encourage consideration of CEMS, which provide a direct measurement of the most critical parameter-emissions themselves. Where a CEMS is not appropriate, we have found that a "formula approach" can be used to determine VOC emissions in a practical, enforceable manner. In the December 2002 NSR improvement final rule, we addressed the mass-balance formula approach in the context of the plantwide applicability limit monitoring system. We explained in the preamble to that rule that our experience, through our flexible pilot permit program, has shown that flexible permit provisions, such as emissions caps, are enforceable as a practical matter by using a mixture of mass balance-based equations, CEMS, and parameter monitoring [67 FR 80208]. We have also used a mass-balance formula approach in the subpart KK standards [see 40 CFR §§ 63.824(b)(1)(i) and 63.824(b)(3)].

Consistent with the June 1989 guidance as clarified by the September 2, 1992 memo from John Rasnic to David Kee, we believe that the formula approach e.g., mass balance approach, is a form of a production or operational limit. The formula approach tracks the emissions and critical short term production and/or operating parameters, documenting a relationship between the parameters and emissions, and inputting the pertinent values into a formula to determine actual emissions from the source. The actual emissions can then be compared directly to the applicable PTE limit. For a source to qualify for the formula approach, its emissions should be capable of being accurately and replicably determined by application of the relevant formula. Thus, the formula approach requires establishing in the permit an explicit relationship between material usage, material properties, capture and control system performance, and/or production data as the basis for calculating actual emissions. Sources like printers that rely on a mass balance approach to determine emissions are prime candidates for using this approach [see generally 67 FR 80211-80213].

To implement the formula approach, you would need to coordinate with facility personnel to document and account for the emissions from the materials consumed at the facility. For example, for rotogravure presses, this might require one equation to address usage of inks, coatings, and solvents, and a second equation for the usage of cleaning materials. For lithographic presses, equations might also be needed for fountain solution additives, with separate equations for manual

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[2] EPA, 1999b: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, letter from John S. Seitz, Director to Messrs. Robert Hodanbosi and Charles Lagges, STAPPA/ALAPCO, May 20, 1999. In enclosure A of the letter, a State or local permitting authority is reminded that if it "...does not want a SIP provision or a SIP-approved permit condition to be listed on a Federal side of a title V permit, it must take appropriate steps in accordance with title I substantive and procedural requirements to delete those conditions from its SIP or SIP-approved permit..." where the term 'SIP-approved permit' is used to refer to permits issued pursuant to major or minor NSR or PSD permit programs approved into SIPs, as well as FESOPs issued pursuant to SIP-approved operating permit programs.

and automatic blanket wash cleaning solvent usage. The equations would be expected to follow essentially the same approach the facility has historically used to calculate emissions. The equations and any appropriate terms and conditions would be incorporated into the facility's NSR or PSD permit. One common term or condition is that the facility maintain records of data used to determine each parameter established in each equation.

The formula approach includes the effect of capture systems and control devices, where these efficiencies are known and can be reliably monitored. We expect continuous parameter monitoring as an indicator of ongoing performance of these systems at the level established through performance testing. In addition, where we have established values for retention of VOC in the substrate or shop towels, or capture of VOC in a dryer (e.g., for heatset lithography), these values may be integrated into the formula approach. Finally, the VOC content of waste materials can be subtracted from emissions, if this quantity is accurately determined and well documented.

In order to ensure practical enforceability of the formula approach, its use should be entirely nondiscretionary and replicable. That is, the formula necessarily yields a unique and repeatable outcome when the required information is input. In addition, the formula(e) should be identified and described in the NSR permit's terms and conditions. Any special cases also should be established in advance. The source's monitoring and tracking methodology also should be established and properly documented. That is, the inputs to the formula(e) should themselves be obtained through replicable procedures, and the operation of the formula(e) should replicably produce the emissions value that is to be compared to the source's emissions limit. The type (but not necessarily the volume and/or amount) of VOC usage may be eligible for protection as confidential business information.

Although you may consider the formula approach for any source, we believe it is well suited to many printers and other source sectors with operations that are highly variable. For example, VOC emissions from a printing press may depend on a combination of factors, including line speed, the dimensions of the substrate, the percent of the surface area printed, the thickness of material applied, the number of application stations in use, and the VOC content of the inks and coatings. At many sources, any or all of these parameters may vary widely from job to job depending on the product being produced and customer specifications, making it virtually impossible, short of a formula approach, to relate emissions with one, or even a few, of the parameters.

The potential benefits of using the formula approach include:

- Provides a verifiable and enforceable approach to calculating actual emissions from the facility so as to assure compliance with an existing PTE limit;
- Allows the facility flexibility to adjust its operations to meet customer demands and to reformulate the process materials to reduce VOC content (and emissions), facilitate possible pollution prevention and increased production; and

- Enables most facilities to utilize their existing material and production tracking systems to verify the data needed to demonstrate compliance under a mass-balance equation-based approach.

In addition, you may want to consider, if consistent with applicable requirements, using the mass-balance equation-based approach, combined with a measure of production (hours of operation, number of impressions, etc.) to determine the emissions from individual presses within a group of similarly operated presses. For example, if a group of four presses is making the same product the same way, the total emissions for the group of presses is calculated and the production of a single press is 20% of the total production of the group of presses, it is reasonable to assume that 20% of the emissions are attributable to that press. Use of such allocations may be particularly appropriate where the group of presses share materials from a common source (e.g., multiple presses receiving ink from a common set of ink totes or central distribution system, fountain solution mixed and distributed to multiple presses by a single system, cleaning solvent dispensed from a single source for an entire pressroom).

6.3.2 Averaging Periods

As noted previously, permit terms that involve short-term averaging or tracking periods also can limit a source's operational flexibility. Two examples of such short-term limits are (1) those voluntarily taken by a source to limit PTE and (2) those taken to meet an applicable requirement with an undefined averaging period.

Short-term limits of the first type often have been included within permits in response to our June 1989 guidance to prevent circumvention of major NSR, which indicated that on controlled sources, a CEMS coupled with "...short term emissions limits (e.g., pounds per hour) would be sufficient to limit potential to emit...". For uncontrolled VOC sources, the June 1989 guidance clarified that record keeping of "...daily quantities and the VOC content of each coating used..." is preferable because it is "...more easily enforceable..." than limitations on production and operation. If limitations on production and operation are used they should be "...as short term as possible and should generally not exceed one month...". In rare instances, annual limits could be rolled monthly. The primary purpose of the 1989 guidance is to recommend adequate monitoring to support timely correction of noncompliance by sources. This, in turn, would prevent you from having to wait for long periods to establish a continuing violation before initiating an enforcement action.

The February 24, 1992 memorandum from John Rasnic, Director, SSCD, OAQPS to David Kee, Director, ARD, Region V, "Use of Long Term Rolling Averages to Limit Potential to Emit," clarified our June 1989 guidance by recognizing that imposition of longer term limits (i.e., those greater that one month) are possible, but not automatic (EPA, 1992b). The February 1992 Guidance provided guidelines for determination of whether to allow long term averages for nine source categories, including printers. According to the February 1992 Guidance, "each case must be independently evaluated...the availability of a twelve month rolling average...is not automatic...it is the burden of the source to demonstrate the need for flexibility." In accordance with the 1989 Guidance (pp. 9-10), the source should demonstrate a history of "substantial and unpredictable" annual variation in their production. As suggested in the February 1992 Guidance, should you allow use of a twelve month rolling average, we encourage you to include permit conditions which provide for interim limits that ensure compliance and enforceability during the first year. Longer averaging times (e.g., monthly) have also been recognized as being generally appropriate in the MACT standards for several types of coating operations. The December 2002 NSR Improvement rulemaking further extends the availability of annual limits, rolled monthly, (i.e., Plantwide Applicability Limitations (PALs)), provided several conditions are met, including several for practical enforceability. In general, PALs, if properly established, provide continuous data to determine ongoing compliance with the plant wide limit. The mass balance approach is recognized in the NSR rulemaking as an example of a sufficient monitoring technique. Also note that there may be potential enforcement consequences to consider in selecting such longer periods, consistent with the approach described in the NSR Improvement rulemaking preamble at 67 FR 80190. You and the source should discuss the appropriate rolling period and you should set the period in the permit consistent with all applicable requirements.

The second type of short-term tracking problem involves limits that by their design neither constrain PTE nor assure compliance with an applicable requirement with a defined averaging time (e.g., MACT standard, certain SIP limits). Rather these limits implement technology requirements without preestablished averaging times (e.g., BACT) or safeguard ambient levels from exceedance. In many instances, the averaging times for such limits have been set in existing permits on a daily or shorter basis. However, in some cases, such as for sources with highly variable operations, it may not be reasonable or accurate to track emissions this frequently. For example, many printing, other coating, and batch chemical processes often conduct jobs or batches that extend across multiple days, making daily tracking a problem. Our June 1989 guidance for PTE limits authorizes the period for such tracking materials usage to extend up to a month in length. We believe, therefore, where a VOC source can demonstrate to you that it is impractical to conduct short-term tracking, you may consider modifying an existing permit, or issuing a permit, that allows the source to determine emissions over a longer period that is more conducive to emissions tracking (up to 1 month), provided that you can and first opt to modify any underlying permit condition.

Where an applicable standard or SIP does not already do so, you can define the averaging or tracking period for these non-PTE emissions limits so as to be both reasonable and consistent with the underlying purpose of the limit. If modeling or ambient monitoring has established a clear link between short-term emissions from a specific source and prohibited short-term ambient impacts, and you believe it is essential for your air quality planning to ensure that a source never exceed such a short-term limit, you should include the limit in its title V permit, along with a practical means to track compliance. Where highly variable operations are subject to effects-based, short-term limits, a CEMS may be the only practical method for determining continuous compliance.

6.3.3 What is an Example of a Mass-Balance Formula Approach?

The following example is based on existing permit terms for a heatset web offset lithographic press with a regenerative afterburner. In this example, as shown in Figure 6-1, 22 separate limits have been established to assure compliance with a PTE limit of 36.7 tpy determined on a rolling 12-month total. The existing limits are presented first, followed by the possible replacement terms as shown in Figure 6-2 based on the formula approach. Note that this example includes only those terms necessary to describe how a mass-balance formula approach could be constructed; actual permit terms and conditions would need to include all relevant, applicable elements, including the monitoring components to ensure practical enforceability

As with the current permit terms, any violation of replacement terms (mass balancing) are potentially subject to enforcement action. The violation may trigger NSR in addition to other enforcement actions consistent with the policy established in the Office of Enforcement and Compliance Assurance's "Guidance on the Appropriate Injunctive Relief for Violations of Major New Source Review Requirements" memorandum, dated November 17, 1998 (EPA, 1998).

I. VOC emissions **shall not exceed** 36.7 tons per year and operation of **equipment shall** comply with the following:

	VOC Content	Usage[a]			VOC Emissions[b]		
Material	% by weight	lb/hr	tons/month	tons/yr	lb/hr	tons/month	tons/yr
Ink	39	195	70	634	6.1	2.2	19.8
Fountain Solution VOC Additives		7.8	2.8	25.4	2.9	1.1	9.4
Blanket Wash	100	4.1	1.5	13.3	2.3	0.9	7.5
					Total	4.2	36.7

[a]Annual VOC emissions limit based on materials consumption listed, VOC content, and 90% control device efficiency.
[b]Assumes 20% of ink solvent retention in web, 50% retention of manual blanket wash in cleaning wipers, 30% of fountain solution is evaporated prior to dryer, none of manual blanket wash and 40% of automatic blanket wash is vented to afterburner system and 90% control by the afterburner system.

II. The afterburner system shall be operated to reduce captured emissions by 90%.

III. Compliance with annual limits shall be determined from a running total of 12 months of data.

Figure 6-1. Sample Existing Permit Limits In an NSR Permit for A Heatset Web Offset Lithographic Press

Using the mass-balance equation-based approach, the above NSR permit terms could be reformatted using three equations as follows:

I. To determine compliance with the annual emissions limit of 36.7 tpy, VOC emissions shall be calculated using the following formulas:

Equation 1.

$$E_M = E_1 + E_2 + E_3 + E_4$$

Where:

E_M = Total VOC Emissions (tons/month) as summed from VOC emissions for individual materials (e.g., ink, fountain solution, etc.)

Equation 2. [a]

$$E_n = U_n \times V_n \times \left(\frac{1 - R_n}{100}\right) \times \left\{1 - \left(\frac{\eta_n}{100}\right) \times \left(\frac{\xi}{100}\right)\right\}$$

Where:

E_n = VOC emissions from an individual material
U_n = Total usage of the individual material
V_n = Actual VOC content averaged over the collection period, e.g., 30 days
ξ = Control Device Efficiency (90%)
R_n = Amount of VOC retained and not emitted
η = Capture efficiency for individual material emitted

Ink (n = 1):

E_1 = Ink VOC Emissions (tons/month)
U_1 = Ink Usage (tons/month)
V_1 = Weighted Average Ink VOC Content (wt%) [b]
R_1 = Ink VOC Retained in Paper (20%) [c, d]
η_1 = Ink VOC Capture Efficiency (100%) [c]

Figure 6-2. Example Permit Terms Setting Forth the Formula Approach In an NSR Permit

Fountain Solution (n = 2): [e]

E_2 = Fountain Solution VOC Emissions (tons/month)
U_2 = Fountain Solution Usage (tons/month)
V_2 = Weighted Average Fountain Solution VOC Content (wt%) [b]
R_2 = Fountain Solution VOC Retained in Paper (0%) [c]
η_2 = Fountain Solution VOC Capture Efficiency (70%) [c, f]

Manual Cleaning Solvent (Blanket Wash) (n = 3):

E_3 = Manual Cleaning Solvent VOC Emissions (tons/month)
U_3 = Manual Cleaning Solvent Usage (tons/month)
V_3 = Weighted Average Manual Cleaning Solvent VOC Content (wt%) [b]
R_3 = Manual Cleaning Solvent VOC Retained in Shop Towels (50%) [c, g]
η_3 = Manual Cleaning Solvent Capture Efficiency (0%) [c]

Automatic Cleaning Solvent (Blanket Wash) (Lithography) (n = 4):

E_4 = Automatic Cleaning Solvent VOC Emissions (tons/month)
U_4 = Automatic Cleaning Solvent Usage (tons/month)
V_4 = Weighted Average Automatic Cleaning Solvent VOC Content (wt%) [b]
R_4 = Automatic Cleaning Solvent VOC Retained (0%) [c, h]
η_4 = Automatic Cleaning Solvent Capture Efficiency (40%) [c]

Equation 3.

$$EA = EM1 + EM2 + EM3 + EM4 + EM5 + EM6 + EM7 + EM8 + EM9 + EM10 + EM11 + EM12$$

Where:

EA = Total VOC emissions (tpy) for the previous 12 months
EM1 through M12 = Total VOC emissions per month (tons/month)

II. For each month, the facility shall record materials usage and VOC content, and calculate VOC emissions, to establish the monthly and rolling 12-month summations of total emissions.

III. The afterburner system shall be operated to reduce captured emissions by 90%.

Figure 6-2 (continued)

Notes:

a. For purposes of simplicity, the emissions from each of the process materials (E_n) are shown as being based on the **total usage** (U_n) and average VOC content (V_n) of the material, when in fact, the total VOC consumption would be based on the sum of the usage and actual VOC contents of each of the (potentially) multiple materials used as in:

$$C_n = \sum_{j=1}^{m} U_{nj} \times V_{nj}$$

Where C_n = total VOC consumption of a category of material n (i.e., ink) and j represents each of the various materials within n

Additionally, the capture and control efficiency for all pollution control devices is assumed to be equal. For a facility with multiple control devices, it is possible that various presses would have differing control device efficiencies, such that:

$$E_n = \sum_{k=1}^{p} C_{nk} \times \left(\frac{1 - R_n}{100}\right) \times \left\{1 - \left(\frac{\eta_n}{100}\right) \times \left(\frac{\xi_k}{100}\right)\right\}$$

Where k represents each of the product of an individual capture and control device pair.

b. Based on Alternative Control Techniques Document and Control Techniques Document for Offset Lithography.
c. Includes all paste inks and varnishes formulated with low volatility ink oils (e.g., Magee Oil).
d. Records of fountain solution concentrate will provide more accurate VOC content and usage figures than press-ready fountain solution data.
e. Records of fountain solution concentrate will provide more accurate VOC content and usage figures than press-ready fountain solution data.
f. Assumes the use of low-volatility alcohol substitutes such as selected glycol ethers or ethylene glycol.
g. Based on the use of low-volatility cleaning solvents (vapor pressure less than or equal to 10 mm Hg at 20°C) and storage of used shop towels containing cleaning solvent in covered containers.
h. Based on the use of low-volatility cleaning solvents (vapor pressure less than or equal to 10 mm Hg at 20°C).

Figure 6-2 (continued)

6.3.4 Are There Any Limitations to Using Replacement Conditions for the Mass Balance Equation-Based Approach?

The replacement permit conditions developed in a parallel NSR permitting activity and described in the above example offer a more flexible approach in the form of limitations on operation and production that can be verified monthly through review of records of materials consumption and VOC content. There are some limitations on using replacement conditions. As appropriate, these conditions as included in the permit should:

- contain the previously established annual emissions limitation which can easily and readily be verified on a no longer than monthly basis;
- set out the methodology (formula-based) by which emissions from various process materials will be determined;
- be supplemented by limitations on control efficiency, or when required by RACT, be supplemented by limitations on ink and coating VOC content, fountain solution VOC content, and cleaning solvent VOC content or vapor pressure;
- link which types and amounts of materials are applied to each press, in cases where the formula is applied to quantify emissions for multiple presses that have separate capture and control equipment with different efficiencies; and
- ensure that no emissions rate exceeds the level allowed by any applicable requirement, including:
  - SIP emissions regulations established to meet NSR control requirements;
  - RACT requirements for sources in ozone nonattainment areas that may necessitate recordkeeping on a more frequent basis than monthly.

CHAPTER 7
REFERENCES

65 FR 62043, 2000: Federal Register, "Method 24A—Determination of Volatile Matter Content and Density of Publication Rotogravure Inks and Related Publication Rotogravure Coatings" Vol. 65, No. 201. October 17, 2000.

67 FR 44766, 2002: Federal Register, "National Emission Standards for Hazardous Air Pollutants From the Portland Cement Manufacturing Industry" Vol. 67, No. 129. July 5, 2002.

EPA, 1978: U.S. Environmental Protection Agency, "Control Technique Guidelines: Volume VII: Graphic Arts – Rotogravure and Flexography." December 1978.

EPA, 1986: U.S. Environmental Protection Agency, "Jefferson County APCD's Request for an Opinion on the Suitability of M24 and M24A as Enforcement Tools," policy memorandum from J.R. Farmer, Emission Standards and Engineering Division to E. Reich, Stationary Source Compliance Division. February 3, 1986.

EPA, 1989: U.S. Environmental Protection Agency, "Guidance on Limiting Potential to Emit in New Source Permitting," policy memorandum signed by Terrell E. Hunt, Office of Enforcement and Compliance Monitoring, and John Seitz, Office of Air Quality Planning and Standards. June 13, 1989.

EPA, 1991: U.S. Environmental Protection Agency, Chemicals and Petroleum Branch, letter from J. Berry to G. Jones, Graphic Arts Technical Foundation. August 8, 1991.

EPA, 1992a: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Stationary Source Compliance Division, "Applicability of Policy on Limiting Potential to Emit to General Motors Morrain Assembly Plant, Dayton, Ohio," memorandum from John Rasnic, Stationary Source Compliance Division. September 2, 1992.

EPA, 1992b: U.S. Environmental Protection Agency, Office of Air Quality Planning And Standards, Stationary Source Compliance Division, "Use of Long Term Rolling Averages to Limit Potential to Emit," memorandum from John Rasnic, Stationary Source Compliance Division. February 24, 1992. http://www.epa.gov/ttn/nsr/gen/u3-5.txt

EPA, 1993a: U.S. Environmental Protection Agency, Draft Control Techniques Guideline for Offset Lithography, "Control of Volatile Organic Compound Emissions from Offset Lithographic Printing." September 1993.

EPA, 1993b: U.S. Environmental Protection Agency, Draft Control Techniques Guideline for Offset Lithography, Appendix D. November 1993.

EPA, 1994: U.S. Environmental Protection Agency, “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.” EPA/453-R-94-054. June 1994.

EPA, 1995a: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, “White Paper for Streamlined Development of part 70 Permit Applications,” memorandum from Lydia N. Wegman, Office of Air Quality Planning and Standards to EPA Regional Office Directors. July 10, 1995.

EPA, 1995b: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, “Potential to Emit for MACT Standards – Guidance on Timing Issues,” memorandum from J. Seitz, Office of Air Quality Planning and Standards. May 16, 1995.

EPA, 1995c: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, “Options for Limiting the Potential to Emit (PTE) of a Stationary Source Under Section 112 and Title V of the Clean Air Act (Act),” memorandum from J. Seitz, Office of Air Quality Planning and Standards and R.I. Van Heuvelen, Office of Enforcement and Compliance Assurance. January 25, 1995.

EPA, 1995d: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emission Monitoring and Analysis Division, “EPA’s VOC Test Methods 25 and 25A” (EMC GD-033), memorandum from John Rasnic, Stationary Source Compliance Division. April 4, 1995. http://www.epa.gov/ttn/emc/guidlnd/gd-033.pdf

EPA, 1995e: U.S. Environmental Protection Agency, “Revised Capture Efficiency Guidance for Control of Volatile Organic Compound Emissions,” policy memorandum from John S. Seitz, Office of Air Quality Planning and Standards to EPA Regional Office Directors. February 1995.

EPA, 1995f: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Emission Monitoring and Analysis Division, “Guidelines for Determining Capture Efficiency” (EMC GD-035), Research Triangle Park, NC 27711. January 9, 1995. http://www.epa.gov/ttn/emc/guidlnd/gd-035.pdf

EPA, 1996a: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, “White Paper Number 2 for Improved Implementation of the part 70 Operating Permits Program.” March 5, 1996.

EPA, 1996b: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, "Release of Interim Policy on Federal Enforceability of Limitations on Potential to Emit," memorandum from J. Seitz, Office of Air Quality Planning and Standards, and R.I. Van Heuvelen, Office of Enforcement and Compliance Assurance. January 22, 1996.

EPA, 1997: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, letter from J. Seitz to G. Jones, Graphic Arts Technical Foundation. July 9, 1997.

EPA, 1998: U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance's "Guidance on the Appropriate Injunctive Relief for Violation of Major New Source Review Requirements," memorandum. November 17, 1998.

EPA, 1999a: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, "Title V Applicability of One-time Reporting Provisions for Nonmajor Sources," memorandum from Steven J. Hitte to Gerald C. Potamis, P.E., Manager, Air Permit Program Unit, Region I. April 19, 1999.

EPA, 1999b U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, letter from John S. Seitz, Director to Messrs. Robert Hodanbosi and Charles Lagges, STAPPA/ALAPCO. May 20, 1999

EPA, 2002a: U.S. Environmental Protection Agency, "Preferred and Alternative Methods for Estimating Air Emissions from the Printing, Packaging, and Graphic Arts Industry," Volume II, Chapter 15. May 2002.

EPA, 2002b: U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Office of Policy, Economics, and Innovation, "Evaluation of Implementation Experiences With Innovative Air Permits - Results of the U.S. EPA Flexible Permit Implementation Review," Summary Report, available at: http://www.epa.gov/ttn/oarpg/t5/memoranda/iap_eier.pdf. December 19, 2002.

EPA, 2004: U.S. Environmental Protection Agency, "National Stack Testing Guidance," memorandum from Michael M. Stahl, Office of Compliance in the Office of Enforcement and Compliance Assurance. February 2, 2004.

APPENDIX A
PRINTING INDUSTRY DESCRIPTION AND RELATIONSHIP TO GUIDANCE

Introduction

Printing facilities present unique challenges in the air permitting arena, and they have often been viewed as a complex source to permit. The diverse applications that exist within the industry, as well as within facilities, cause this complexity. Printing is a manufacturing process used to create such diverse items as decals, labels, books, pamphlets, potato chip bags, candy bar wrappers, soft drink cans, fleet markings, and imprinted textiles. Facilities engaged in the production of these products have chosen printing as their manufacturing technology and often do not consider themselves "printers," but converters, packagers, or manufacturers.

The following discussion provides background on the various printing processes including: 1) offset lithography; 2) flexography; 3) publication rotogravure and product rotogravure; and 4) screen printing. The manufacturing of printed matter and packaging can be broken into three distinct steps – prepress, press, and postpress activities. These steps, in relation to the various printing processes are explained in detail below. In addition, Table A-1 provides a crosswalk between the guidance provided in the different subsections of this document and the different printing technologies.

Prepress Activities

There are several preparatory steps that have to be conducted prior to printing. The goal of the steps in the prepress area is to produce a plate or similar image carrier such as a screen. The steps involve the preparation of text and images by typesetting and scanning. The separate text and image(s) can then be output onto black and white film negatives. The separate negatives are then mounted together on a common material referred to as a stripping flat. This assembled image is then used to make another photographic black and white film negative. This negative is then used to make the plate or image carrier.

With the advent of computers and new software, many printers are now able to prepare the images and text together and expose the combined text and images directly onto a film negative. In some instances, the entire procedure of imaging to film and then to a plate or other image carrier is eliminated and the plate is directly exposed.

In commercial and other types of printing, it is common practice to produce a proof of the job to be printed prior to the actual printing. This proof is used to check image quality, placement of text and images, and color contrast. Proofs are generated from a variety of output devices and many of them now are digital or computer driven.

Film processors, used to make film negatives, are self-contained units that run at or slightly above room temperature. The VOC emissions from film processors are not significant. The principal reason why the VOC contained in film processing chemistry is not completely released is because these chemistries are water-based and are not designed to work by evaporation. The main source of chemical release from these processors is wastewater discharges.

Typically, the wastewater discharges are high in biological or chemical oxygen demand. This is a clear indicator that the effluent contains a large amount of organic material that is biodegradable. The composition of the discharges from film processors include the dissolved unhardened emulsions, silver in the form of silver thiosulfate, and processing chemicals, some of which are considered VOC. Many printers utilize state of the art silver recovery technology to reduce silver discharges.

All of the organic-based chemicals in film processing chemistries have specific functions and must stay in solution in order for the chemistry to perform its intended function. It is important to note that the chemicals listed on an MSDS are not the ones that are always present in solution. For example, hydroquinone is used to initiate the development process and actually is consumed in the process. Sodium acetate is used as a buffer and is not lost to the atmosphere.

It is also interesting to note that all of these photochemistries are available in a dry crystalline form. Many of the chemicals considered VOCs would be solids at room temperature.

The only releases of VOC containing material from the film processors would be the result of evaporation and the drying process in which the film is passed under to evaporate the wash water. This moist warm air would contain a trace amount of material. For this and the above reasons, it is assumed that a one percent or less emissions factor for VOCs would be appropriate. The one percent emissions factor translates into a 10,000-ppm concentration. Since most work place exposure monitoring usually shows employee exposures to chemicals like acetic acid to be below 10 ppm, the one percent emissions factor often overstates VOC emissions.

Likewise, the vast majority of lithographic plate developing systems are water-based and not solvent-based. In essence, they work by removing the unhardened image area from the plate surface. In the plate imaging process, the image area is hardened by exposure to UV light. Plate development systems, like photo processing units, are enclosed and the effluent is discharged to the sewer.

The VOCs contained in plate chemistry tend to occur in low concentrations ranging from about five to ten percent and are usually alcohols. Alcohols are completely miscible in water, and very little is lost to evaporation. There are no elevated temperatures used in plate developing. The same one percent or less emissions factor as presented in the film chemistry section would also apply.

Some of the new direct-to-plate systems require a baking step to further harden the image area after development. This baking step is performed on the dry imaged plate and no solvents are used in this step.

In screen printing prepress, the screen, a porous polyester mesh that has been attached to a metal frame, is coated with a photochemically reactive emulsion. A film positive is adhered to the screen, and the screen is then placed on a vacuum table. While in the vacuum table, the screen is exposed to ultra violet light. The emulsion hardens, except in the image area. The screen is then placed in a washout tank, and water is used to rinse the screen. Similar to other print processes, the chemicals used in screen preparation contain negligible amounts of VOCs, and the wastewater discharges tend to contain a large amount of organic material that is biodegradable.

Similar to other industry sectors, screen printing is moving towards the use of digital pre-press technology that will allow the screen to be pre-imaged with the use of little or no chemistry. Digital pre-press technology is used quite a bit to produce the film positives.

Modern proofing systems have now moved away from using solvents to develop the images. Typically, output devices fall into three categories of dry toner, ink jet, and dye sublimation. In the case of dry toners and dye sublimation system, there are no solvents used in the process. Ink jet inks are usually water-based and use vegetable dyes. They are virtually identical to ink jet printers that are commonly found in offices and home.

Conventional proofing systems have moved away from solvent-based developers to water-based ones, dramatically reducing the amount of VOC emissions. Older proofing systems could use a developing solution of up to fifty percent solvent. New systems are water-based and contain very little solvent, about five percent. The solvents are usually alcohol based and, like plate and photo processors, do not work by evaporation. Their principal discharge is wastewater that is discharged to the local sewer.

Proof presses are usually small presses that are only set up and run to produce a limited number of proofs. Proofing systems are used to evaluate product quality and to show the customer what a final version of the product will look like. There may be VOC emissions associated with some of these operations, but they are typically expected to be minor and insignificant.

While not necessarily all that common, another prepress technology used in printing is blueprint making systems. Blueprinting operations are occasionally performed at printing facilities. These systems are water-based and the principal air byproduct is a small amount of ammonia.

<u>Press Activities</u>

The pressroom accounts for the vast majority of emissions released from any printing operation. The pressroom is where most inks and coatings, as well as other input materials, are applied to the substrate. The differences between the various print processes is evident in the press area. The processes vary in the type of input materials and equipment used. It is important to understand that the differences are so distinct that the input materials and equipment, as well as the control approaches, are not interchangeable. For example, inks used for offset lithographic operations cannot be used in screen printing applications.

Offset lithography is a planographic printing system where the image and nonimage areas are chemically differentiated; the image area is oil receptive and nonimage area is water receptive. In printing, a thin film of aqueous solution (fountain or dampening solution) is applied to the plate and wets the nonimage area. Then ink is applied to the plate, where it adheres to the image area. On modern lithographic presses, the printing plate is attached to a cylinder and the ink on the plate is transferred, or offset, to a rubber-covered blanket, which in turn transfers the ink to the paper. Thus, the term "offset" is used to describe these types of presses. One revolution of the printing plate cylinder is referred to as an impression.

Offset lithographic ink drying is divided into two categories–heatset or non-heatset. Heatset ink, as the name implies, is dried by the evaporation of ink oil at an elevated temperature. The heatset process is a web (i.e., a continuous roll of substrate) printing process where heat is used to evaporate ink oils from the printing ink. Heatset dryers (typically hot air) are used to deliver the heat to the printed web.

In non-heatset lithographic printing operations, the printing inks are set without the use of heat. Traditional non-heatset inks set and dry by absorption and/or oxidation of the ink oils. For the purposes of this document, ultraviolet-cured and electron beam-cured inks are considered non-heatset, although radiant energy is required to cure these inks. Both sheetfed (i.e., individual sheets printed sequentially) and web fed presses are utilized with non-heatset ink systems.

Flexography utilizes a plate cylinder wherein a flexible rubber or elastomeric sleeve or plate, containing a raised image relative to the nonimage area, is affixed to the cylinder. The image is transferred to the substrate through first applying ink to either a smooth roller or to an anilox roller, which in turn rolls the ink onto the raised pattern of the plate cylinder, which then rolls the ink onto the substrate.

Inks and coatings can either be solvent or water based. Ink may be metered through a series of rollers and transferred to the plate cylinder or applied directly to an anilox roller which would transfer the ink to the plate cylinder. The anilox roller is engraved or etched with micro cells which may be scraped with a doctor blade to control ink and coating application. The inked image is transferred directly to the substrate from the plate. Most flexographic printing presses are web fed.

Rotogravure utilizes a chrome-plated cylinder where the image area is recessed relative to the nonimage area. Images are transferred onto a substrate through first applying ink to a cylinder into the surface of which small, shallow cells have been etched forming a pattern, then wiping the lands between the cells free of ink with a doctor blade, and finally rolling the substrate over the cylinder so that the surface of the substrate is pressed into the cells, transferring the ink to the substrate.

Inks and coatings can either be solvent or water-based. The inked image is transferred directly to the substrate from the cylinder.

Screen printing utilizes a web or fabric to which a refined form of stencil has been applied and the printing ink is forced through onto the substrate. The stencil openings determine the form and dimensions of the imprint. This method is known for its ability to impart relatively heavy deposits of ink onto practically any type of surface, in a controlled pattern.

Inks and coatings can be solvent-based, water-based, or radiation curable systems. The inked image is transferred directly to the substrate through the screen.

After printing on one particular job is completed, the press needs to be set up for the next one. This preparatory phase is often referred to as “makeready” and during this phase, the screen is removed and replaced with a new one, the press cleaned, inks changed (if necessary), and new substrate is loaded into the equipment.

<u>Postpress Activities</u>

Postpress activities is a term used to describe those activities associated with the final stage of the manufacturing process where the printed sheet or other printed substrate is subjected to one or more finishing steps. These steps include, but are not limited to, cutting, slitting, folding, trimming, die cutting, embossing, foil stamping, drilling, saddle stitching, sewing, binding, vacuum forming, laminating, and gluing.

In the cutting, slitting, folding, trimming, die cutting, embossing, foil stamping, drilling, saddle stitching, vacuum forming, and sewing operations, no VOC-containing materials are utilized. The only emissions would be particulate matter from the paper dust. Most of these pieces of equipment do not have any direct exhaust associated with them. They are "vented" into the facility. Some of the larger printing operations use cyclones and/or vacuum pumps to create a vacuum for a centralized trim collection system. Occasionally, a bag house can be attached to the exhaust of cyclones. These systems can either be vented outside or back into the building.

In perfect binding lines, the cut and gathered printed pages are "sanded" with rotary sanding discs to increase the surface area of the portion to be bound. After sanding or roughing, hot melt adhesive is applied in a thin strip and the cover is attached. The particulate matter generated by this operation is typically vented to a baghouse, which is in turn vented inside the facility.

In lithographic printing, adhesives are used in the production of products ranging from books, magazines, direct mail pieces, advertisements, business forms, folding paper boxes such as food packaging, inserts, to letterhead and envelopes. Substrate, function, application methods and other production drive the specific type of adhesive that is used. As each of these products is unique, the physical and chemical characteristics of the adhesives used in their manufacture are also different. For example, some adhesive application activities occur after the actual printing process with separate equipment or integrated lines that can fold, cut, trim, emboss, foil stamp, coat, laminate, and glue.

The other common type of adhesive application is performed in-line during the actual printing production step, where the adhesive is generally applied after the desired images and text has been applied or "printed" to the substrate. Generally, in-line application of adhesives will occur on web presses and not sheetfed presses. An adhesive used in-line must have properties compatible with the line speeds that are common on today's modern printing presses. They need to be able to be both applied and dried quickly.

The specific adhesives that are used for a given application depend upon the product's end use and substrate characteristics. The critical substrate characteristics include surface area, surface structure, and surface energy. For example, an adhesive used to bind the spine of a book, magazine, or telephone directory must be flexible and pliable as these products will be opened and closed multiple times. The adhesive must be capable of withstanding multiple flexing without allowing the pages to fall out. Conversely, applying a glassine or other similar clear window to an envelope requires an adhesive that can wet the surface of the window material allowing the adhesive to spread and eventually bind to the envelope's substrate. The ability to wet the substrate is very important when the substrate is nonporous and only certain technologies can be used to accomplish this goal.

Likewise, the selection of adhesives in the flexographic, rotogravure, and screen printing industries are driven by the unique demands of their processes, substrates, and end use. For example, some flexible food packages are composed of multiple layers of foil, polymer, and paper substrates. The demands of adhesives for these types of substrates are vastly different than those for products produced via the lithographic process. The adhesive properties required for these products are not the same as those produced via the lithographic printing operations.

The range of adhesives used in printing operations fall into three broad categories: hot melts, water-based, and solvent-based adhesives. Many of the adhesives used in the gluing steps contain little or no VOCs. For example, hot melt adhesives are solid at room temperature and must be heated to allow them to become "fluid" enough so they can be applied. Attempts at measuring the VOC content of these adhesives using Method 24 have been challenging. Nevertheless, the data indicate they have an extremely minimal VOC content.

Many water-based glues also contain little or no VOCs. Such glues are derived from animal rendering operations and are comparable to Elmers Glue® commonly found in homes and schools. They routinely test, via Method 24, as having no VOC content.

The third type of adhesive is a more traditional solvent-based one. Some of these adhesives are used to prepare pads and multi-part business forms. Some laminates can also be solvent-based. In some applications, newer low (or no) VOC adhesives have been introduced that allow for a reduction in VOC emissions.

Approaches for Printing Technologies

Table A-1 identifies which printing technologies are addressed by the TSD approaches provided in each chapter.

Table A-1. Applicability of TSD Approaches to Each Printing Technology

Topic (Section)	Offset Lithography	Screen Printing	Flexography	Packaging Rotogravure	Publication Rotogravure
Chapter 2 Applicability of Title V Permit Requirements					
Applicability of Title V (2.1 & 2.2)	X	X	X	X	X
Applicable Requirements Overview (2.3)	X	X	X	X	X
Example Requirements (2.3, App. B)			X	X	X
Insignificant Sources (2.3.3)	X	X	X	X	X
Chapter 3 MACT Standards Permitting					
Subpart KK Printing MACT Overview (3.1)			X	X	X
Compliance Flexibility Under Subpart KK (3.2)			X	X	X
MACT General Provisions and Subpart KK (3.3)			X	X	X
Subpart JJJJ Web Coating MACT (3.4)	X	X	X	X	X
	Applies to any web coating unit at a major HAP source regardless of printing process				
Chapter 4 Monitoring and Practical Enforceability					
Compliance Assurance Monitoring (4.1)	X	X	X	X	X
Monitoring for PTE Limit (4.2)	X	X	X	X	X
Materials Monitoring for Subpart KK (4.3)			X	X	X
Monitoring for Visible Emissions (4.4)	X	X	X	X	X
Monitoring Under Subpart KK (4.5)			X	X	X
Monitoring Examples	X (Table 4-1)		X (Table 4-2)	X (Table 4-2)	X (Table 4-3)
Example Monitoring Permit Conditions for Subpart KK (Figures 4-1 & 4-2)			X	X	X
Chapter 5 Testing Requirements					
Material Composition Data Sources (5.1)	X	X	X	X	X
Material Testing Methods (5.2)	X	X	X	X	X
Cleaning Solvent Retention Factor (5.3)	X	X	X	X	X

Table A-1 (continued)

Topic (Section)	Offset Lithography	Screen Printing	Flexography	Packaging Rotogravure	Publication Rotogravure
Use of Method 25A in VOC Tests (5.4)	X	X	X	X	X
Testing Frequency for Capture & Control (5.)	X	X	X	X	X
Performance Tests Under Subpart KK (5.6)			X	X	X
Capture & Control Performance Test Conditions (5.7)	X	X	X	X	X
Low Concentration in Control Device Exhaust (5.8)	X	X	X	X	X
Chapter 6 Additional Permitting Approaches					
Overview (6.1)	X	X	X	X	X
Streamlining Permits (6.2)	X	X	X	X	X
Modifying NSR Permit Terms (6.3)	X	X	X	X	X
Formula Approach Permit Example (6.3.3)	X				
Appendices					
Printing Industry Description (Appendix A)	X	X	X	X	X
Example Applicable Requirements (Appendix B)			X	X	X
MACT Compliance Options (Appendix C)			X	X	X
Monitoring Protocols (Appendix D)	X	X	X	X	X
Monitoring Material Usage (Appendix E)			X	X	X

APPENDIX B
EXAMPLE APPLICABLE REQUIREMENTS

Table B-1. POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic with Solvent Recovery Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart FFF**	**Subpart A**	**Subpart KK**
Emission/ Operating Limits	• 90% recovery efficiency of VOCs entering system • 65% overall control efficiency for combined capture and recovery systems for Product and Packaging Rotogravure • 60% overall control efficiency for combined capture and recovery systems for Wide Web Flexographic operations • Generally applies to emissions from the application of inks and coatings by each individual press • Compliance options include: liquid-liquid material balance (LLMB) or performance test and parameter monitoring such as VOC inlet/outlet (referred to as Test/Monitor approach).	• Requirements generally follow SIP-RACT requirements with same or greater stringency for control of emissions • Ranging from 70% to 98% overall control efficiency • May include mass VOC emission limits and/or mass VOC usage limits to hold potential emissions below permitting thresholds • Generally applies to emissions from the application of inks and coatings by the individual new/ modified press, or collectively by a group of new/modified presses controlled by the same solvent recovery system • Requirements established through preconstruction review	• No additional requirements	• Applies to each product rotogravure printing line used to print or coat flexible (sheet or web) vinyl or urethane products (e.g., vinyl wallpaper, upholstery) [§60.580(a)] • Packaging rotogravure and wide web flexographic printing are NOT subject to subpart FFF • Applies to emissions from the application of inks and coatings by each new rotogravure printing line constructed after 1/18/83 [§60.580(b)] • 85% overall VOC control of each affected facility [§60.582(a)(2)]	• New/reconstructed major sources must submit application for preconstruction review by EPA, or by State program that has been delegated MACT standard enforcement responsibilities [§63.5]	• Applies collectively to major sources of HAPs with rotogravure and wide-web flexographic presses if presses apply greater than 500 kg/month of inks & coatings or 400 kg/month of organic HAPs [§63.820(a)(1) & §63.821(b)] • Applies to all roto./flexo. presses (together) plus other optional equipment [§63.821(a)(2)] • Overall organic HAP control efficiency of at least 95% each month [§63.825(b)(7)], *or* • Emission rate of no more than 0.2 kg organic HAP per kg. solids applied, monthly average, as-applied basis [§63.825(b)(8)], *or* • Emission rate of no more than 0.04 kg organic HAP per kg material applied, monthly average, as-applied basis [§63.825(b)(9)], *or* • Option based on weighted calculations between alternatives [§63.825(b)(10)]

Table B-1. POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic with Solvent Recovery Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart FFF**	**Subpart A**	**Subpart KK**
Other - Work Practice Standards	• Operation & maintenance of control devices and monitors according to manufacturer recommendations • Material handling and good housekeeping practices may also apply	• Similar to SIP-RACT requirements	• Operate and maintain affected facility and control equipment consistent with good air pollution control practices [§60.11(d)]	• See subpart A	• Operate and maintain source and control equipment consistent with good air pollution control practices [§63.6(e)(1)] • Develop and implement a written start-up, shutdown, and malfunction (SSM) plan for affected source and control equipment [§63.6(e)(3)]	• See subpart A

Table B-1. POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic with Solvent Recovery Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart FFF**	**Subpart A**	**Subpart KK**
Testing	• LLMB Approach: Conduct LLMB study over extended time period (i.e., month) to determine recovery efficiency or • Test/Monitor Approach: Initial compliance test of solvent recovery device efficiency including verification of VOC continuous emission monitors and capture efficiency • VOC content of materials based on M24, of 40 CFR part 60, Appendix A) and/or supplier formulation data • May require periodic re-testing	• Same as SIP-RACT requirements	• Conduct performance test 60 -180 days after start-up in accordance with test methods and procedures in applicable standard [§60.8(a)] • Provide at least 30 days notice of scheduled test date [§60.8(d)] • Test/Monitor Approach: continuous monitoring systems (CMS) must be subject to a performance evaluation during performance test [§60.13(a)]	• Performance test under, continuous normal operating conditions consisting of 3 runs (minimum of 30 minutes each) measuring recovery system VOC inlet and outlet concentrations simultaneously and volumetric flowrate; capture efficiency must also be determined [§60.583(d)] • VOC measurements based on M25A [§60.583(a)(2)] • All fugitive VOC emissions shall be captured and vented through stacks suitable for measurement during test [§60.583(d)(4)] • Performance test determines the average exhaust vent VOC concentration [§60.584(a)(2)]	• If required, initial performance test required within 180 days of the effective date of standard or after initial start-up of new unit [§63.7(a)] • Notification of test at least 60 days in advance [§63.7(b)] • Development, and if requested, submittal of site-specific test plan at least 60 days in advance of test [§63.7(c)] • Performance test shall be conducted under normal operating conditions [§63.7(e)] • Test/Monitor Approach: CMS Performance Evaluations for VOC inlet/outlet mass rate monitoring system with initial test [§63.8(e)(4)]	• LLMB Approach: Conduct monthly LLMB; no performance test required [§63.825(c)(1) and §63.827(a)(3)] • Determine volatile matter content and other properties required to conduct LLMB based on M24 or formulation data [§63.827(c)(2) & (c)(3)] • Test/Monitor Approach: If compliance based on monitoring VOC inlet & outlet mass rates, conduct initial performance for capture efficiency using Procedure T (M204) [§63.825(c)(2) & §63.827(e)] • Operate monitoring system for capture efficiency operating parameter measured during initial test [§63.828(a)(5)] • Conduct quarterly audits of CMS in accordance with Appendix F of 40 CFR part 60 [§63.828(a)(2)(i)] • See subpart A

Table B-1. POTENTIALLY APPLICABLE REQUIREMENTS
Product and Packaging Rotogravure or Wide-Web Flexographic with Solvent Recovery Control Strategy

Applicable Requirement	Representative SIP-RACT (all subject sources)	Example NSR Requirements	NSPS (Part 60)		MACT (Part 63)	
			Subpart A	Subpart FFF	Subpart A	Subpart KK
Monitoring	• LLMB Approach: track VOC usage and VOC recovered over specified time period • Test/Monitor Approach: VOC monitoring, inlet and outlet VOC concentration and/or mass rate • VOC monitoring approach may require parameter monitoring for capture monitoring (i.e., differential pressure if permanent total enclosure) • May require parameter monitoring for capture and control systems including development and submittal of compliance assurance monitoring (CAM) plan with the initial and/or renewal title V application [§64.1 - §64.10] • Exempt from CAM rule if subject to subpart KK MACT standard or if recovery system qualifies as "inherent process equipment" rather than "control device." operating conditions [§64.1]	• Same as SIP-RACT requirements	• Required CMS subject to the applicable performance specifications in Appendix B and quality assurance procedures in Appendix F [§60.13(a)] • Monitors required to be installed and operational prior to time of performance test, consistent with manufacturer's recommendations for installation, operation, and calibration [§60.13(b)] • Record four or more data points equally spaced over each hour; do not include data recorded during breakdowns, repairs, calibrations, etc. [§60.13(h)] • Conduct daily CMS zero, span, and drift calibration [§60.13(d)]	• Install, calibrate, operate, and maintain system for continuously measuring and recording VOC concentration of exhaust stream [§60.584(a)]	• Operate and maintain CMS consistent with good air pollution control practices, in accordance with manufacturer's specifications for installation, operation and calibration [§63.8(c)(1) -(c)(3)] • Conduct daily zero and span (or high-level) calibration drift checks at least once daily [§63.8(c)(6)]	• LLMB Approach: measure cumulative amount of volatile matter and HAP material applied and amount of volatile matter recovered by the solvent recovery device [§63.825(c)(1)] • Install, calibrate, maintain, and operate device, certified to within ±2.0 percent to measure the cumulative amount of volatile matter recovered [§63.825(c)(1)(v)] • Test/Monitor Approach: continuously measure and record inlet and outlet VOC concentrations and volumetric flow rates [§63.828(a)(2)] • Test/Monitor Approach: monitor capture efficiency parameter in accordance with capture efficiency monitoring plan [§63.828(a)(5)]

Table B-1. POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic with Solvent Recovery Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart FFF**	**Subpart A**	**Subpart KK**
Recordkeeping	• Solvent recovery system operation and maintenance procedures • Preventative maintenance and/or malfunction prevention and abatement plan • Maintenance logs for control, capture, and monitoring equipment • material properties and usage data, source operation data, and calculations to support compliance demonstration • LLMB Approach: records of periodic material balance calculations • Test/Monitor Approach: VOC inlet/outlet concentration and mass flowrate data, recovery system efficiency calculations for specified time period • Results from performance tests	• Same as SIP-RACT requirements	• Occurrence and duration of any SSM of the affected facility; any malfunction of the control system; or any periods inoperative continuous monitors [§60.7(b)] • Records of all CMS and device measurements, performance evaluations, calibration checks, and adjustments and maintenance performed [§60.7(f)]	• Average exhaust gas VOC concentration measured during initial test [§60.584(a)(2)] • Record for each 3-hour clock period that the average exhaust vent VOC concentration is greater than 50 ppm and more than 20% greater than the average concentration demonstrated during the most recent performance test [§60.584(a)(2)] • Time periods of operation when control device not in use • [§60.584(d)] • See subpart A	• Written SSM plan for the source, control system, and monitoring system [§63.6(e)(3)(v)] • Records showing consistency of actions with SSM plan [§63.6(e)(3)(iii) & §63.10(b)(2)] • Records showing any actions inconsistent with SSM plan [§63.6(e)(3)(iv)] • Test/Monitor Approach: written CMS quality control program [§63.8(d)] • Test/Monitor Approach: records of data from CMS measurements, audits, calibrations, and malfunctions [§63.10(b)(2) & §63.10(c)] • Records of all reports and notifications [§63.10(b)] • Records of each applicability determination [§63.10(b)(3)]	• LLMB Approach: amount of volatile matter and HAP consumed and amount of volatile matter recovered for each month [§63.829(c)] • Test/Monitor Approach: monthly summaries of continuous monitoring data, capture efficiency parameter data, and control efficiency calculations as rolling 3-hour averages • Calculations for monthly: overall control efficiency, or HAP emission rate per solids applied, or HAP emission rate per material applied [§63.825(c)(2) & §63.829(b)] • See subpart A

Table B-1. POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic with Solvent Recovery Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart FFF**	**Subpart A**	**Subpart KK**
Reporting	• Periodic Compliance Reports • Performance test protocol (if test required) • Test notification • Test results report • Annual VOC emission statements	• Same as SIP-RACT requirements	• Notification of: commencement of construction, start-up, and CMS performance evaluation [§60.7(a)] • Semiannual excess emissions and monitoring system performance report [§60.7(c) & 7(d)] • Initial performance test report [§60.8(a)] • CMS performance evaluation report for initial performance test [§60.13(b)(2)]	• Performance test data and results [§60.585(a)] • Semiannual reports of exceedances of the average value of exhaust vent VOC concentration [§60.585(b)] • See subpart A	• Initial notification of standard applicability [§63.9(b)] • SSM plan submittal, if requested [§63.6(e)(3)(v)] • Notification of initial performance test and submittal of site-specific test plan if requested [§63.7(b), 7(c) & 9(e)] • Submittal of test report [§63.7(g)] • Semiannual SSM reports [§63.10(d)(5)(I)] • Reports on operation inconsistencies with SSM plan [§63.6(e)(3)(iv)] • Notification of CMS performance evaluation, submittal of evaluation plan and evaluation results [§63.8(e), 9(g)(1) & 10(e)(2)] • Notification of Compliance Status Report [§63.9(h)] • Semiannual excess emissions and CMS performance report [§63.10(e)(3)]	• Capture Compliance Monitoring Plan with the Notification of Compliance Status Report (not applicable to LLMB) [§63.827(a)(3)] • See subpart A

Table B-2. POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic with Compliant Inks/Coatings Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart FFF**	**Subpart A**	**Subpart KK**
Emission/ Operating Limits	• The volatile fraction of ink, as it is applied to the substrate, contains 25% by volume or less of VOC and 75% by volume or more of water; *or* • The ink, as it is applied to the substrate, less water, contains 60% by volume or more nonvolatile material • Generally applies based on daily average of volume fractions for all inks/coatings applied by each individual press	• Requirements generally follow SIP-RACT requirements with same or greater stringency for compliant coating specifications • May include mass VOC emission limits and/or mass VOC usage limits to hold potential emissions below permitting thresholds • Generally applies based on daily average of volume fractions for all inks/coatings applied by each individual new or modified press	• No additional requirements	• Applies to new product rotogravure printing and/or coating of flexible (sheet or web) vinyl or urethane products (e.g., vinyl wallpaper, upholstery) [§60.580(a)] • Packaging rotogravure and wide web flexographic printing are NOT subject to subpart FFF • Applies to weighted average of all inks and coatings applied by each individual new rotogravure printing line constructed after 1/18/83 [§60.580(b)] • Use inks with a weighted average VOC content less than 1.0 kilogram VOC per kilogram ink solids [§60.582(a)(1)] • Weighted over period of no more than a month for subject printing line [§60.583(a)(3)]	• New/reconstructed major sources must submit application for preconstruction review by EPA, or by State program that has been delegated MACT standard enforcement responsibilities [§63.5]	• Applies to major sources of HAPs with rotogravure and wide-web flexographic presses if presses apply greater than 500 kg/month of inks & coatings or 400 kg/month of organic HAPs [§63.820(a)(2) & §63.821(b)] • Applies to all roto./flexo. presses (together) plus other optional equipment [§63.821(a)(2)] • Complying without controls requires organic HAP emissions no more than 4% of the mass of inks applied for the month**,** [§63.825(b)] *or* • No more than 20% of the mass of solids applied for the month [§63.825(b)] *or* • Calculated equivalent allowable mass based on the organic HAP and solids contents [§63.825(b)] • Averaged over month across affected facility [§63.825(b)]
Other - Work Practice Standards	• Material handling and good housekeeping practices may apply	• No additional requirements	• Operate and maintain affected facility consistent with good air pollution control practices [§60.11(d)]	• See subpart A	• Operate and maintain source consistent with good air pollution control practices [§63.6(e)(1)]	• See subpart A

Table B-2. POTENTIALLY APPLICABLE REQUIREMENTS
Product and Packaging Rotogravure or Wide-Web Flexographic with Compliant Inks/Coatings Control Strategy

Applicable Requirement	Representative SIP-RACT (all subject sources)	Example NSR Requirements	NSPS (Part 60)		MACT (Part 63)	
			Subpart A	Subpart FFF	Subpart A	Subpart KK
Testing	• For each applied material, determine VOC, exempt solvent and water content, density, and volume and weight fraction solids, based on M24 (40 CFR part 60, Appendix A) and/or supplier formulation data	• Same as SIP-RACT requirements	• No additional requirements	• Determination of weighted VOC content of the inks calculated for periods not exceeding a calendar month (considered as performance test) [§60.583(b)(3)] • Determination based on manufacturers' formulation data for purchased materials, facility blending records, and/or M24 analyses of the applied materials [§60.583(b)(4)] • Only M24 data can be used to determine VOC content of inks to be discarded [§60.583(c)(3)]	• No additional requirements	• Determination of organic HAP content of applied materials based on data from M311 (40 CFR part 63, Appendix A) and/or manufacturers' formulation data on certified product data sheets (CPDSs), or use volatile matter content data to represent organic HAP content [§63.827(b)(2)] • Determination of volatile matter content of applied materials based on M24 data and/or manufacturers' formulation data [§63.827(c)(2)]
Monitoring	• Applied material usage and VOC, water, exempt solvents, and solids content data	• Same as SIP-RACT requirements	• No additional requirements	• Applied material usage and VOC content data for each affected facility to determine weighted average VOC content [§60.583(b)(1) & (b)(2)] • May determine weighted average VOC content based on inventory tracking system for each affected facility for each averaging period [§60.583(c)(1)]	• No additional requirements	• Applied material usage and HAP and VOC content and solids content data needed to demonstrate compliance [§63.829(b)(1)]

Table B-2. POTENTIALLY APPLICABLE REQUIREMENTS Product and Packaging Rotogravure or Wide-Web Flexographic with Compliant Inks/Coatings Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart FFF**	**Subpart A**	**Subpart KK**
Recordkeeping	• Applied material usage and property data and calculations demonstrating compliance for each averaging time and applicable unit	• Same as SIP-RACT requirements	• No additional requirements	• Applied material usage and property data and calculations demonstrating compliance for each averaging time and affected unit [§60.583(b) & (c)]	• Records of all reports and notifications [§63.10(b)] • Records of each applicability determination [§63.10(b)(3)]	• Mass of each applied material consumed each month and the Organic HAP and/or volatile material content of each applied material [§63.829(b)(1)] • Monthly calculations demonstrating compliance with appropriate limit [§63.829(b)(1)] • See subpart A
Reporting	• Periodic Compliance Reports • Annual VOC emission statements	• Same as SIP-RACT requirements	• Notification of: commencement of construction and start-up [§60.7(a)] • Initial performance test report [§60.8(a)]	• Initial performance test data and report [§60.583(b)(4)] • Semiannual report of exceedances of the weighted average VOC content limit [§60.585(b)(1)] • See subpart A	• Initial notification of standard applicability [§63.9(b)] [§63.6(e)(3)(iv)] • Notification of Compliance Status Report [§63.9(h)] • Semiannual excess emissions report [§63.10(e)(3)]	• See subpart A

Table B-3. POTENTIALLY APPLICABLE REQUIREMENTS Publication Rotogravure with Solvent Recovery Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart QQ**	**Subpart A**	**Subpart KK**
Emission/ Operating Limits	• 90% recovery efficiency of VOC's entering system • 75% overall control efficiency for combined capture and recovery systems • Generally applies to emissions from the application of inks and coatings by each individual printing press • Compliance options include: liquid-liquid material balance (LLMB) or performance test and parameter monitoring such as VOC inlet/outlet (referred to as Test/Monitor approach).	• Requirements generally follow SIP-RACT requirements with same or greater stringency for control of emissions • Ranging from 75% to 98% overall control efficiency • May include mass VOC emission limits and/or mass VOC usage limits to hold potential emissions below permitting thresholds • Generally applies to emissions from the application of inks and coatings by the individual new or modified press or collectively by a group of new/modified presses controlled by the same solvent recovery system • Requirements established through preconstruction review	• No additional requirements	• Applies to rotogravure production presses installed after October 28, 1980 [§60.430] • Applies to emissions from the application of inks and coatings by the individual new or modified press or collectively by a group of new/modified presses controlled by the same solvent recovery system [§60.430(a) & §60.4330(d)] • Emit no more than 16% of the total mass of VOC solvent and water used during any one performance period (4 weeks or 1 month) [§60.432]	• New/reconstructed major sources must submit application for preconstruction review by EPA, or by State program that has been delegated MACT standard enforcement responsibilities [§63.5]	• Applies collectively to all publication press and affiliated equipment [§63.821(a)] • Emit no more organic HAP than 8% of the total volatile matter (including water) used each month [§63.824(b)]

Table B-3. POTENTIALLY APPLICABLE REQUIREMENTS
Publication Rotogravure with Solvent Recovery Control Strategy

Applicable Requirement	Representative SIP-RACT (all subject sources)	Example NSR Requirements	NSPS (Part 60)		MACT (Part 63)	
			Subpart A	Subpart QQ	Subpart A	Subpart KK
Other - Work Practice Standards	• Operation & maintenance of control devices and monitors according to manufacturer recommendations	• Same as SIP-RACT requirements	• Operate and maintain affected facility and control equipment consistent with good air pollution control practices [§60.11(d)]	• See subpart A	• Operate and maintain source and control equipment consistent with good air pollution control practices [§63.6(e)(1)] • Develop and implement a written start-up, shutdown, and malfunction (SSM) plan for affected source and control equipment [§63.6(e)(3)]	• See subpart A

Table B-3. POTENTIALLY APPLICABLE REQUIREMENTS Publication Rotogravure with Solvent Recovery Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart QQ**	**Subpart A**	**Subpart KK**
Testing	• LLMB Approach: Conduct LLMB study over extended time period (i.e., month) to determine recovery efficiency or • Test/Monitor Approach: Initial compliance test of solvent recovery device efficiency including verification of VOC continuous emission monitors and capture efficiency • VOC content of materials based on M24A (40 CFR part 60, Appendix A) and/or supplier formulation data • May require periodic re-testing	• Same as SIP-RACT requirements	• Conduct performance test 60 -180 days after start-up in accordance with test methods and procedures in applicable standard [§60.8(a)] • Provide at least 30 days notice of scheduled test date [§60.8(d)] • Test/Monitor Approach: continuous monitoring system (CMS) must be subject to a performance evaluation during performance test [§60.13(c)]	• LLMB Approach: Initial performance test over 30 calendar days measuring LLMB including temperature and liquid densities of solvent and water-based materials [§60.433] • *Solvent-borne ink systems* - determine VOC content from M24A each week or per shipment, or from formulation data per shipment [§60.435(a)] • *Water-borne ink systems* - determine the VOC and water content from the formulation data with each shipment; or analysis of samples of each shipment [§60.435(c)] • Determine the density of raw inks, related coatings, and VOC solvent by making a total of three determinations for each liquid at specified temperatures using ASTM D 1475-60; or using literature values acceptable to the Administrator [§60.435(d)]	• If required, initial performance test required within 180 days of the effective date of standard or after initial start-up of new unit [§63.7(a)] • Notification of test at least 60 days in advance [§63.7(b)] • Development and, if requested, submittal of site-specific test plan at least 60 days in advance of test [§63.7(c)] • Performance test shall be conducted under normal operating conditions [§63.7(e)] • Test/Monitor Approach: CMS Performance Evaluations for VOC inlet/outlet mass rate monitoring system with initial test [§63.8(e)]	• LLMB Approach: Conduct monthly LLMB; no performance test required [§63.824(b)(1)(I) and §63.827(a)(3)] • Test/Monitor Approach: If compliance based on monitoring VOC inlet & outlet mass rates, conduct initial performance for capture efficiency using Procedure T (M204) [§63.824(b)(1)(ii) & §63.827(e)] • Operate monitoring system for capture efficiency operating parameter during initial test [§63.828(a)(5)] • Conduct quarterly audits of CMS in accordance with Appendix F of 40 CFR part 60 [§63.828(a)(2)(I)] • See subpart A

Table B-3. POTENTIALLY APPLICABLE REQUIREMENTS
Publication Rotogravure with Solvent Recovery Control Strategy

Applicable Requirement	Representative SIP-RACT (all subject sources)	Example NSR Requirements	NSPS (Part 60)		MACT (Part 63)	
			Subpart A	Subpart QQ	Subpart A	Subpart KK
Monitoring	• LLMB Approach: track VOC usage and VOC recovered over specified time period • Test/Monitor Approach: VOC monitoring, inlet and outlet VOC concentration and/or mass rate • VOC monitoring approach may require parameter monitoring for capture monitoring (i.e., differential pressure if permanent total enclosure) • May require parameter monitoring for capture and control systems including development and submittal of compliance assurance monitoring (CAM) plan with the initial and/or renewal title V application [§64.1 - §64.10] • Exempt from CAM rule if subject to subpart KK MACT standard or if recovery system qualifies as "inherent process equipment" rather than "control device." [§64.1]	• Same as SIP-RACT requirements	• Required monitors installed and operational prior to time of performance test consistent with manufacturer's recommendations for installation, operation, and calibration [§60.13(b)]	• Amount of solvent and water used and solvent recovered for either each calendar month or 4 consecutive weeks [§60.434(a)] • Liquid temperature (optional, if owner chooses not to use values determined in the performance test) [§60.434(a)(4)]	• Operate and maintain CMS consistent with good air pollution control practices, in accordance with manufacturer's specifications for installation, operation and calibration [§63.8(c)(1) -(c)(3)] • Conduct daily zero and span calibration checks [§63.8(c)(6)]	• LLMB Approach: measure cumulative amount of volatile matter and HAP consumed and amount of volatile matter recovered by the solvent recovery device [§63.824(b)(1)] • LLMB Approach: install, calibrate, maintain, and operate device, certified to within ±2.0 percent to measure the cumulative amount of volatile matter recovered [§63.824(b)(1)(i)(D)] • Test/Monitor Approach: continuously measure and record inlet and outlet VOC concentrations and volumetric flow rates [§63.824(b)(1)(ii)(A)] • Test/Monitor Approach: monitor capture efficiency parameter in accordance with capture efficiency monitoring plan [§63.824(b)(1)(ii)(D) & §63.828(a)(5)]

Table B-3. POTENTIALLY APPLICABLE REQUIREMENTS Publication Rotogravure with Solvent Recovery Control Strategy						
Applicable Requirement	**Representative SIP-RACT (all subject sources)**	**Example NSR Requirements**	**NSPS (Part 60)**		**MACT (Part 63)**	
			Subpart A	**Subpart QQ**	**Subpart A**	**Subpart KK**
Recordkeeping	• Solvent recovery system operation and maintenance procedures • Preventative maintenance and/or malfunction prevention and abatement plan • Maintenance logs for control, capture, and monitoring equipment • material properties and usage data, source operation data, and calculations to support compliance demonstration • LLMB Approach: records of periodic material balance calculations • Test/Monitor Approach: VOC inlet/outlet concentration and mass flowrate data, recovery system efficiency calculations for specified time period • Results from performance tests	• Same as SIP-RACT requirements	• Occurrence and duration of any SSM of the affected facility and any malfunction of the control system [§60.7(b)] • All measurements, testing results, and other records required for compliance demonstration maintained for 2 years [§60.7(f)]	• Record for each performance period of the amount of solvent and water used, solvent recovered, and estimated emissions percentage for each averaging period maintained for 2 years [§60.434(a)] • Record of temperature for determining actual liquid densities during the performance test, and, at the sources option each performance averaging period [§60.434(a)(3) & (a)(4)] • See subpart A	• Written SSM plan for the source, control system, and monitoring system [§63.6(e)(3)(v)] • Records showing consistency of actions with SSM plan [§63.6(e)(3)(iii) & §63.10(b)(2)] • Records showing any actions inconsistent with SSM Plan [§63.6(e)(3)(iv)] • Test/Monitor Approach: written CMS quality control program [§63.8(d)] • Test/Monitor Approach: records of data from CMS measurements, audits, calibrations, and malfunctions [§63.10(b)(2) & §63.10(c)] • Records of all reports and notifications [§63.10(b)] • Records of each applicability determination [§63.10(b)(3)]	• LLMB Approach: amount of volatile matter and HAP consumed and amount of volatile matter recovered for each month [§63.829(c)] • Test/Monitor Approach: monthly summaries of continuous monitoring data, capture efficiency parameter data, and control efficiency calculations as rolling 3-hour averages [§63.824 & §63.829] • Calculations for monthly: overall control efficiency, [§63.824(b)(1)(ii) & §63.829(b)] • See subpart A

Table B-3. POTENTIALLY APPLICABLE REQUIREMENTS
Publication Rotogravure with Solvent Recovery Control Strategy

Applicable Requirement	Representative SIP-RACT (all subject sources)	Example NSR Requirements	NSPS (Part 60)		MACT (Part 63)	
			Subpart A	Subpart QQ	Subpart A	Subpart KK
Reporting	• Periodic Compliance Reports • Performance test protocol (if test required) • Test notification • Test results report • Annual VOC emission statements	• Same as SIP-RACT requirements	• Notification of: commencement of construction, and start-up [§60.7(a)] • Semiannual excess emissions report [§60.7(c) & 7(d)] • Initial performance test report [§60.8(a)]	• See subpart A	• Initial notification of standard applicability [§63.9(b)] • SSM plan submittal, if requested [§63.6(e)(3)(v)] • Notification of initial performance test and submittal of site-specific test plan if requested [§63.7(b), 7(c) & 9(e)] • Submittal of test report [§63.7(g)] • Semiannual SSM reports [§63.10(d)(5)(I)] • Reports on operation inconsistencies with SSM plan [§63.6(e)(3)(iv)] • Notification of CMS performance evaluation, submittal of evaluation plan and evaluation results [§63.8(e), 9(g)(1) & 10(e)(2)] • Notification of Compliance Status Report [§63.9(h)] • Semiannual excess emissions and CMS performance report [§63.10(e)(3)]	• Capture Compliance Monitoring Plan with the Notification of Compliance Status Report [§63.828(a)(5)] • Reporting requirements in subpart A related to SSM plan, CMS performance evaluation, capture monitoring plan, and an initial performance test do not apply if compliance strategy is based on LLMB [§63.830(b)(5)] • See subpart A

APPENDIX C
MACT COMPLIANCE OPTIONS FOR COMPLIANT COATINGS APPROACH

This Appendix provides a summary of the subpart KK compliance options for a facility that operates wide-web flexographic presses and uses compliant coatings. It also provides a table illustrating the types of corresponding permit terms that you might consider.

EXAMPLE
Compliance Options for a Wide-Web Flexographic Facility Using Compliant Coatings

Example Facility

The facility is assumed to be an existing major source of HAP that operates six wide-web flexographic printing presses, designated as WWF01 through WWF06. The facility has opted to meet subpart KK through the use of compliant materials (low-HAP inks, solvents, etc.).

Applicability

Under the definitions in 40 CFR §63.822, the presses at this facility are considered “wide-web flexographic presses." Because the facility is a major source of HAP that operates such a press, subpart KK applies to the facility [see 40 CFR § 63.820(a)(1)].

The "affected source" under subpart KK consists of all six presses combined. None of the presses qualify for the exemptions for proof presses [see 40 CFR § 63.821(a)(2)(i)]; for “ancillary printing” [presses primarily used for coating, laminating, or other operations; see 40 CFR § 63.821(a)(2)(ii)]; or for “incidental printing” [low usage presses; see 40 CFR § 63.821(b)(1) and (2)]. Further, the facility has not elected to include in the affected source any stand-alone coating equipment that would be eligible for inclusion under 40 CFR § 63.821(a)(3).

Method of Compliance Determination

For this example, the facility has a wide margin of compliance because most inks, solvents, etc., have very low (or zero) HAP content, although a few low-use materials are not compliant as purchased. The facility will demonstrate compliance based on purchase records, treating all materials as if they were used on the day they were delivered to the facility. This approach, which minimizes tracking procedures, is possible because of the wide margin of compliance.

Desired Compliance Flexibility

For the permit conditions that follow, the facility wishes to maintain the flexibility to demonstrate monthly compliance using any of the six options in the rule that are based on compliant materials.

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Compliance Options for a Wide-Web Flexographic Facility Using Compliant Coatings

Example Permit Conditions for subpart KK

APPLICABILITY OF 40 CFR PART 63, SUBPART KK

1. The facility is subject to the provisions of 40 CFR part 63, subpart KK–National Emission Standards for the Printing and Publishing Industry (hereinafter "subpart KK"). [see 40 CFR § 63.820(a)(1)] In addition, the facility is subject to the provisions of 40 CFR part 63, subpart A–General Provisions (hereinafter "the General Provisions"), to the extent specified in Table 1 of subpart KK [see 40 CFR § 63.823]. For convenience, Table 1 of subpart KK is attached to this permit. Subsequent conditions of this permit specify how the applicable General Provisions sections related to performance tests and monitoring are to be applied to this facility.

2. The affected source consists of the six wide-web flexographic presses designated by the facility as WWF01 through WWF06. [§63.821(a)(2)] Each wide-web flexographic press included in the affected source consists of the unwind or feed section; the series of work stations; the dryers associated with the work stations (including any interstage dryers and overhead tunnel dryers); and the rewind, stack, or collection station. The work stations may be oriented vertically, horizontally, or around the circumference of a single large impression cylinder. Inboard and outboard work stations (including those employing any other technology, such as rotogravure) are included if they are capable of printing or coating on the same substrate [see 40 CFR § 63.822(a)].

EMISSIONS LIMITATION

3. Beginning on May 30, 1999, the facility shall limit organic HAP emissions from the affected source (1) to no more than 5 percent of the organic HAP applied for the month; or (2) to no more than 4 percent of the mass of inks, coatings, varnishes, adhesives, primers, solvents, reducers, thinners, and other materials applied for the month; or (3) to no more than 20 percent of the mass of solids applied for the month; or (4) to a calculated equivalent allowable mass based on the organic HAP and solids contents of the inks, coatings, varnishes, adhesives, primers, solvents, reducers, thinners, and other materials applied for the month [see 40 CFR §§ 63.825(b) and 63.826(a)].

   For the purposes of this permit, a "month" means a calendar month [see 40 CFR § 63.822(a)].

   [For this example, it is assumed that the facility did not establish an alternative "prespecified period of 28 days to 35 days" as allowed by §63.822(a). As appropriate, an alternative "month" may be specified during initial permit issuance, when the permit

EXAMPLE
Compliance Options for a Wide-Web Flexographic Facility Using Compliant Coatings

is reopened to incorporate the MACT standard, or with a minor permit modification (MPM).]

COMPLIANCE DETERMINATIONS

4. The facility shall demonstrate compliance for each month by one of the methods indicated in Table C-1 of this permit, beginning with June 1999 [see 40 CFR § 63.825(b)(1) - (6)].

[Condition No. 4 is based on the facility being an existing source with a compliance date of May 30, 1999. The date should be adjusted as appropriate for new or reconstructed affected sources with different applicable compliance dates. Including the date reinforces that compliance demonstrations using compliant coating options begin immediately upon the compliance date and that the General Provisions' allowance for later performance tests does not apply.]

The compliance demonstration methods are summarized below (see the cited sections of the rule for the full requirements):

A. §63.825(b)(1)
   i. Determine the organic HAP content, on an as-purchased basis, of each material applied during the month. (See Condition No. 5 for HAP content determination procedures.)
   ii. Show that the organic HAP weight fraction of each material is ≤0.04.

B. §63.825(b)(2)
   i. Determine the organic HAP content, on an as-purchased basis, of each material applied during the month. (See Condition No. 5 for HAP content determination procedures.)
   ii. Measure the mass of each solids-containing material (e.g., ink) applied during the month, on an as-purchased basis. (See Condition No. 6 for material usage tracking procedures.)
   iii. For each individual solids-containing material, measure the mass of each non-solids-containing material (e.g., thinner) added to the solids-containing material during the month, on an as-purchased basis. (See Condition No. 6 for material usage tracking procedures.)
   iv. Calculate the monthly average as-applied organic HAP weight fraction for each solids-containing material using Equation 3 of subpart KK.
   v. Show that the monthly average as-applied organic HAP weight fraction of each solids-containing material is ≤0.04.

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C. §63.825(b)(3)

i. Determine the organic HAP content, on an as-purchased basis, of each material applied during the month. (See Condition No. 5 for HAP content determination procedures.)

ii. Use the procedures of Condition No. 4B to determine which solids-containing materials achieve a monthly average as-applied organic HAP weight fraction $\leq$0.04.

iii. For solids-containing materials that do not achieve a monthly average as-applied organic HAP weight fraction $\leq$0.04, determine the as-purchased weight fraction of solids (See Condition No. 5 for solids content determination procedures.)

iv. For each of these other solids-containing materials, calculate the monthly average as-applied solids content using Equation 4 of subpart KK.

v. For each of these other solids-containing materials, calculate the average monthly as-applied organic HAP-to-solids ratio using Equation 5 of subpart KK.

vi. Show that for each solids-containing material either (1) the monthly average as-applied organic HAP weight fraction is $\leq$0.04 or (2) the monthly average as-applied organic HAP-to-solids ratio is $\leq$0.20.

D. §63.825(b)(4)

i. Determine the organic HAP content, on an as-purchased basis, of each material applied during the month. (See Condition No. 5 for HAP content determination procedures.)

ii. Measure the mass of each material applied during the month, on an as-purchased basis. (See Condition No. 6 for material usage tracking procedures.)

iii. Calculate the monthly average as-applied organic HAP content of all materials applied using Equation 6 of subpart KK.

iv. Show that the monthly average as-applied organic HAP weight fraction of all materials applied is $\leq$0.04.

E. §63.825(b)(5)

i. Determine the organic HAP content, on an as-purchased basis, of each material applied during the month. (See Condition No. 5 for HAP content determination procedures.)

ii. Determine the as-purchased weight fraction of solids in each solids-containing material applied during the month. (See Condition No. 5 for solids content determination procedures.)

iii. Measure the mass of each material applied during the month, on an as-purchased basis. (See Condition No. 6 for material usage tracking procedures.)

iv. Calculate the monthly average as-applied organic HAP-to-solids ratio using Equation 7 of subpart KK.

v. Show that the monthly as-applied organic HAP-to-solids ratio is $\leq$0.20.

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F. §§63.825(b)(6) and 63.825(e)

i. Determine the organic HAP content, on an as-purchased basis, of each material applied during the month. (See Condition No. 5 for HAP content determination procedures.)

ii. Measure the mass of each material applied during the month, on an as-purchased basis. (See Condition No. 6 for material usage tracking procedures.)

iii. Calculate the total mass of organic HAP applied during the month using Equation 8 of subpart KK.

iv. Determine the as-purchased weight fraction of solids in each solids-containing material applied during the month. (See Condition No. 5 for solids content determination procedures.)

v. For the month, determine the as-purchased mass fraction of each solids-containing material which was applied at 20 weight-percent or greater solids content, on an as-applied basis.

vi. Determine the total mass of non-solids-containing materials added during the month to solids-containing materials which were applied at less than 20 weight-percent solids content, on an as-applied basis.

vii. Calculate the monthly allowable organic HAP emissions using Equation 17 of subpart KK.

viii. Show that the total mass of organic HAP applied during the month (from Equation 8) is less than the allowable organic HAP emissions for the month (from Equation 17).

[These monthly compliance determinations are not considered "performance testing, or another form of compliance demonstration" for purposes of §63.7(a)(1) of the General Provisions. Accordingly, §63.7 of the General Provisions, with its requirements for advance notifications, site-specific test plans, and test reports, does not apply to the monthly compliance determinations.]

<u>PERFORMANCE TEST METHODS</u>

5. As necessary according to Table C-1 of this permit for the selected compliance demonstration option, the facility shall determine the organic HAP, volatile matter, and/or solids weight fraction of each ink, coating, varnish, adhesive, primer, solvent, thinner, reducer, diluent, and other material applied, using the procedures indicated in Table C-1 [see 40 CFR §§ 63.827(b)(2), (c)(2), and (c)(3)].

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Compliance Options for a Wide-Web Flexographic Facility Using Compliant Coatings

The material composition determination methods are summarized below (see the cited sections of the rule for the full requirements):

A. Organic HAP Content [§63.827(b)(2)]. Determine organic HAP content according to i, ii, or iii below, subject to the provisions of iv:

i. Use Method 311 (40 CFR part 63, appendix A).
ii. Determine volatile matter content and use this value for the organic HAP content for all compliance purposes.
iii. Use formulation data provided on a Certified Product Data Sheet.
iv. If a Method 311 test value is higher than formulation data, the Method 311 test data govern.

B. Volatile Matter and Solids Content [§63.827(c)(2) and (3)]. Determine volatile matter and solids content according to i or ii below, subject to the provisions of iii:

i. Use Method 24 (40 CFR part 60, appendix A).
ii. Use formulation data.
iii. If there is any inconsistency between the formulation data and the results of Method 24, the Method 24 data govern.

[Section 63.7(f) applies if the facility wants to rely on an alternative test method for determining material composition. However, the material composition determinations required in § 63.827 generally are not considered "performance tests" for purposes of the General Provisions. Accordingly, the rest of §63.7 and other related provisions of the General Provisions do not apply to these composition determinations. See Section 5.4.3 for additional guidance.]

<u>MONITORING AND MATERIAL USAGE TRACKING REQUIREMENTS</u>

As discussed in Chapter 4 of the TSD, we believe that it is important for you and the facility to come to a common understanding of the measurement procedures that will be used to demonstrate compliance. (See Appendix D for more on this topic.)

In this example, to achieve this end, we have included a summary of the measurement procedures in the permit. As mentioned in Chapter 4 of the TSD, we believe that this is one approach that can clarify the measurement expectations on both sides and may be appropriate for inclusion in the QA / QC plan required by subpart KK. When you and the facility have agreed on specific procedures, facility inspections and file reviews, as well as MACT and Title V compliance certifications, are straightforward and unambiguous.

Another approach that can bring focus to material usage tracking systems is to classify such

EXAMPLE
Compliance Options for a Wide-Web Flexographic Facility Using Compliant Coatings

systems as continuous monitoring systems (CMS) that are subject to the CMS provisions of the MACT General Provisions. We have not taken this approach in this example, but we do not object to your doing so in your jurisdiction. However, should you do so, be aware that the MACT General Provisions are written to apply most directly to CEMS, COMS, and CPMS. If you take this approach, you should take care to interpret the General Provisions reasonably for the types of instruments and recordkeeping systems that make up each material usage tracking system.

6. The measurement, recordkeeping, and calculation procedures used by the facility to demonstrate compliance on a monthly basis are summarized in the following conditions:

    A. General approach: The facility shall collect data for each month on the amount of each material applied on the wide-web flexographic printing affected source, and on the composition of each material applied (HAP, solids, and/or volatile matter content, depending on the compliance option used). Using these data, the facility shall determine its compliance status for each month using one of six options in subpart KK (see Condition No. 4).

    B. Material usage tracking methods and location: The facility shall collect purchase records for each month on the inks, coatings, varnishes, adhesives, primers, solvents, reducers, thinners, diluents, and other materials used on the affected source. For purposes of demonstrating compliance, the facility shall treat each material purchased as if it were all applied on the day it was delivered to the facility. The facility shall collect data on the composition of each material, such as test data or Certified Product Data Sheets (CPDS) from the supplier. The facility shall retain material composition data in a permanent file. The facility shall determine compliance for each month using any of the six compliance options in 40 CFR 63.825(b)(1) through (6).

    C. Indicator range: This parameter is not applicable to this monitoring approach. The facility determines compliance directly for each month by one of the six compliant coating options in 40 CFR 63.825(b)(1) through (6).

    D. Data collection frequency: At least monthly.

    E. Averaging period: For the compliance options in 40 CFR 63.825(b)(2), (3), (4), and (5), the facility shall average the data for each monthly compliance demonstration. For the compliance options in 40 CFR 63.825(b)(1) and (6), the facility shall demonstrate compliance monthly, but will not average the data.

    F. Recordkeeping: The facility shall keep records of data on HAP and solids content (as necessary for the compliance option) in a permanent file. The facility shall keep records of all material usage measurements (including inventory data and purchase records), and all material composition data (including Method 24/311 data and/or CPDS from suppliers) pursuant to *[insert the provisions of your title V program that implement 40 CFR 70.6(a)(3)(ii) and (iii)]*.

G. QA/QC: The facility shall review data collection, calculation, and recordkeeping procedures at least annually to ensure that they are adequate to determine compliance conclusively and that they are being implemented properly by facility personnel. The facility shall also use Method 24/311 QA/QC procedures if those methods are used.

<u>RECORDKEEPING REQUIREMENTS</u>

7. The facility shall maintain files of all information (including all reports and notifications) required under this permit recorded in a form suitable and readily available for expeditious inspection and review. The files shall be retained for at least 5 years following the date of each occurrence, measurement, maintenance, corrective action, report, or record. At a minimum, the most recent 2 years of data shall be retained on site. The remaining 3 years of data may be retained off site. Such files may be maintained on microfilm, on a computer, on computer floppy disks, on magnetic tape disks, or on microfiche [see 40 CFR §§ 63.829(b) and 63.10(b)(1)].

8. The facility shall maintain records as indicated in Table C-1 of this permit. Additional detail regarding these requirements, as well as additional recordkeeping requirements not related to compliance, follows:

   A. The facility shall maintain records on a monthly basis of all measurements needed to demonstrate compliance, such as material usage, HAP usage, solids usage, and material composition [see 40 CFR §§ 63.829(b)(1) and 63.10(b)(2)(vii)].

   B. The facility shall maintain records of all documentation supporting the initial notification [previously submitted by the facility pursuant to 40 CFR 63.830(b)(1)] and the notification of compliance status [previously submitted by the facility pursuant to 40 CFR 63.830(b)(3)] [see 40 CFR § 63.10(b)(2)(xiv)].

   C. The facility shall maintain records of each applicability determination performed by the facility in accordance with the requirements of 40 CFR 63.820(a) [see 40 CFR §§ 63.829(b)(2) and 63.10(b)(3)].

   D. The following recordkeeping requirements are not applicable to this facility at this time:

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i. Sections 63.10(b)(2)(i) - (vi) and (viii) - (xiii) and 63.10(c) do not apply because the facility does not operate an add-on control device (and consequently, startup, shutdown, and malfunction provisions do not apply) and the facility's material usage tracking system is not classified as a CMS.
ii. Section 63.829(c) does not apply because the facility does not comply through liquid-liquid material balance.
iii. Sections 63.829(d), (e), and (f) do not apply because the facility is not utilizing any of the exemptions with which these records are associated.
iv. Section 63.10(b)(2)(xii) does not apply because the facility has not obtained a waiver of recordkeeping and reporting requirements pursuant to §63.10(f).

[For this example, the facility does not have a recordkeeping and reporting waiver. If the facility had a recordkeeping and reporting waiver, §63.10(b)(2)(xii) would apply, as well as any requirements related to the waiver (such as conditions for the waiver or alternative recordkeeping and reporting requirements). These requirements should be detailed in the permit.]

REPORTING AND NOTIFICATION REQUIREMENTS

9. The facility shall submit the reports and notifications indicated in Table C-1 of this permit and specified below. In addition to the reporting and notification requirements of subpart KK, the facility is subject to the general reporting provisions of the General Provisions at 40 CFR 63.10(d), to the extent indicated by Table 1 to subpart KK. Based on the monitoring system described in Condition No. 6 above (which is not classified as a CMS), these provisions are interpreted and applied as indicated in the following conditions:

A. Summary reports [§63.830(b)(6) and 63.10(e)(3)] shall be submitted on a semi-annual basis. Summary reports shall cover the periods from January 1 through June 30, and from July 1 to December 31, and shall be submitted within 30 days after the end of each period. Summary reports shall include the following information:

i. The company name and address of the affected source
ii. An identification of each hazardous air pollutant
iii. The beginning and ending dates of the reporting period
iv. A brief description of the process unit
v. The applicable emissions limitations specified in §63.825
vi. The dates of any periodic QA/QC reviews (see Condition No. 6G) that were conducted during the reporting period, and the results of these reviews
vii. An emissions data summary identifying any months in which the affected source did not comply with the applicable emissions limitations specified in §63.825

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viii. A description of any changes in processes or controls since last reporting period (if applicable)
ix. The name, title, and signature of the responsible official who is certifying the accuracy of the report
x. The date of the report

The schedule for submitting reports can be changed per §63.10(a)(5), (6) and (7).

B. A report of any change in information already provided in the Notification of Compliance Status or the Initial Notification shall be provided in writing within 15 calendar days after the change. [§63.9(j)]

C. The following reporting requirements are not applicable to this facility at this time:

i. Sections 63.830(b)(2), (4), and (5) and 63.10(d)(2) and (5) do not apply because the facility does not operate an add-on control device (and consequently, the performance test provisions and the startup, shutdown, and malfunction provisions do not apply)
ii. Sections 63.830(b)(6)(ii) - (iv) do not apply because the facility is not utilizing any of the exemptions with which this information is associated
iii. Section 63.10(d)(4) does not apply because the facility has not received an extension of compliance and is not required to submit the associated progress reports
iv. Sections 63.10(e) does not apply, except to the extent indicated in §63.830(b)(6), because the facility's material usage tracking system is not classified as a CMS.

For this example, it is assumed that the facility has already submitted the Initial Notification and the Notification of Compliance Status (NOCS).

TABLE 1 TO 40 CFR PART 63, SUBPART KK

General Provisions Reference	Applicable to Subpart KK	Comment
§63.1(a)(1)-(a)(4)	Yes	
§63.1(a)(5)	No	Section reserved
§63.1(a)(6)-(a)(8)	No	
§63.1(a)(9)	No	Section reserved
§63.1(a)(10)-(a)(14)	Yes	
§63.1(b)(1)	No	Subpart KK specifies applicability
§63.1(b)(2)-(b)(3)	Yes	
§63.1(c)(1)	Yes	
§63.1(c)(2)	No	Area sources are not subject to subpart KK
§63.1(c)(3)	No	Section reserved
§63.1(c)(4)	Yes	
§63.1(c)(5)	No	
§63.1(d)	No	Section reserved
§63.1(e)	Yes	
§63.2	Yes	Additional definitions in subpart KK
§63.3(a)-(c)	Yes	
§63.4(a)(1)-(a)(3)	Yes	
§63.4(a)(4)	No	Section reserved
§63.4(a)(5)	Yes	
§63.4(b-c)	Yes	
§63.5(a)(1)-(a)(2)	Yes	
§63.5(b)(1)	Yes	
§63.5(b)(2)	No	Section reserved
§63.5(b)(3)-(b)(6)	Yes	
§63.5(c)	No	Section reserved
§63.5(d)	Yes	
§63.5(e)	Yes	
§63.5(f)	Yes	
§63.6(a)	Yes	
§63.6(b)(1)-(b)(5)	Yes	

General Provisions Reference	Applicable to Subpart KK	Comment
§63.6(b)(6)	No	Section reserved
§63.6(b)(7)	Yes	
§63.6(c)(1)-(c)(2)	Yes	
§63.6(c)(3)-(c)(4)	No	Sections reserved
§63.6(c)(5)	Yes	
§63.6(d)	No	Section reserved
§63.6(e)	Yes	Provisions pertaining to start-ups, shutdowns, malfunctions, and CMS do not apply unless an add-on control system is used
§63.6(f)	Yes	
§63.6(g)	Yes	
§63.6(h)	No	Subpart KK does not require COMS
§63.6(i)(1)-(i)(14)	Yes	
§63.6(i)(15)	No	Section reserved
§63.6(i)(16)	Yes	
§63.6(j)	Yes	
§63.7	Yes	
§63.8(a)(1)-(a)(2)	Yes	
§63.8(a)(3)	No	Section reserved
§63.8(a)(4)	No	Subpart KK specifies the use of solvent recovery devices or oxidizers
§63.8(b)	Yes	
§63.8(c)(1)-(3)	Yes	
§63.8(c)(4)	No	Subpart KK specifies CMS sampling requirements
§63.8(c)(5)	No	Subpart KK does not require COMS
§63.8(c)(6)-(c)(8)	Yes	Provisions for COMS are not applicable
§63.8(d)-(f)	Yes	
§63.8(g)	No	Subpart KK specifies CMS data reduction requirements
§63.9(a)	Yes	
§63.9(b)(1)	Yes	
§63.9(b)(2)	Yes	Initial notification submission date extended
§63.9(b)(3)-(b)(5)	Yes	

General Provisions Reference	Applicable to Subpart KK	Comment
§63.9(c)-(e)	Yes	
§63.9(f)	No	Subpart KK does not require opacity and visible emissions observations
§63.9(g)	Yes	Provisions for COMS are not applicable
§63.9(h)(1)-(h)(3)	Yes	
§63.9(h)(4)	No	Section reserved
§63.9(h)(5)-(h)(6)	Yes	
§63.9(i)	Yes	
§63.9(j)	Yes	
§63.10(a)	Yes	
§63.10(b)(1)-(b)(3)	Yes	
§63.10(c)(1)	Yes	
§63.10(c)(2)-(c)(4)	No	Sections reserved
§63.10(c)(5)-(c)(8)	Yes	
§63.10(c)(9)	No	Section reserved
§63.10(c)(10)-(c)(15)	Yes	
§63.10(d)(1)-(d)(2)	Yes	
§63.10(d)(3)	No	Subpart KK does not require opacity and visible emissions observations
§63.10(d)(4)-(d)(5)	Yes	
§63.10(e)	Yes	Provisions for COMS are not applicable
§63.10(f)	Yes	
§63.11	No	Subpart KK specifies the use of solvent recovery devices or oxidizers
§63.12	Yes	
§63.13	Yes	
§63.14	Yes	
§63.15	Yes	

TABLE C-1. COMPLIANCE OPTIONS FOR WWF01 THROUGH WWF06 UNDER SUBPART KK

Affected Source: Wide-web flexographic presses WWF01 through WWF06; all emission points combined [§63.821(a)(2)]
Emission Limits: Limit emissions for the month to ≤5% of the organic HAP applied; or to ≤4% of the mass of materials applied; or to ≤20% of the mass of solids applied; or to a calculated equivalent allowable mass. [§63.825(b)]
Compliance Options: The facility may use any of the six compliance options based on compliant coatings, as detailed in the table below.

Compliant Materials Compliance Option	Performance Testing/ Compliance Demonstration	Recordkeeping	Notifications and Reporting [a]
A. §63.825(b)(1) Each material used contains ≤0.04 weight fraction organic HAP, as purchased	Compliance demonstration (monthly) [§63.825(b)(1)]; see Condition 4A HAP content analysis[§63.827(b)(2)]; see Condition 5A	Measurements needed to demonstrate compliance [§§63.829(b)(1) and 63.10(b)(2)(vii)] General recordkeeping [§63.10(b)] See Conditions 7 and 8	Semiannual reports [§§63.830(b)(6) and 63.10(e)(3)] See Condition 9
B. §63.825(b)(2) Each <u>solids-containing</u> material used contains ≤0.04 weight fraction organic HAP, monthly average as-applied basis	Compliance demonstration (monthly) [§63.825(b)(2)]; see Condition 4B HAP content analysis[§63.827(b)(2)]; see Condition 5A Material usage measurements [§63.825(b)(2)(ii)] *(implied by Eq. 3)* See Condition 6	Measurements needed to demonstrate compliance [§§63.829(b)(1) and 63.10(b)(2)(vii)] General recordkeeping [§63.10(b)] See Conditions 7 and 8	Semiannual reports [§§63.830(b)(6) and 63.10(e)(3)] See Condition 9

Compliant Materials Compliance Option	Performance Testing/ Compliance Demonstration	Recordkeeping	Notifications and Reporting [a]
C. §63.825(b)(3) Each solids-containing material used contains ≤0.04 weight fraction organic HAP or ≤0.20kg HAP per kg solids, monthly average as-applied basis	Compliance demonstration (monthly) [§63.825(b)(3)]; see Condition 4C HAP content analysis [§63.827(b)(2)]; see Condition 5A Solids content analysis [§63.827(c)(2)]; see Condition 5B Material usage measurements [§63.825(b)(3)(ii)] *(implied by Eqs. 3 and 4)* See Condition 6	Measurements needed to demonstrate compliance [§§63.829(b)(1) and 63.10(b)(2)(vii)] General recordkeeping [§63.10(b)] See Conditions 7 and 8	Semiannual reports [§§63.830(b)(6) and 63.10(e)(3)] See Condition 9
D. §63.825(b)(4) Average HAP content of materials applied ≤0.04 kg HAP per kg material, as applied	Compliance demonstration (monthly) [§63.825(b)(4)]; see Condition 4D HAP content analysis [§63.827(b)(2)]; see Condition 5A Material usage measurements [§63.825(b)(4)] *(implied by Eq. 6)* See Condition 6	Measurements needed to demonstrate compliance [§§63.829(b)(1) and 63.10(b)(2)(vii)] General recordkeeping [§63.10(b)] See Conditions 7 and 8	Semiannual reports [§§63.830(b)(6) and 63.10(e)(3)] See Condition 9

Compliant Materials Compliance Option	Performance Testing/ Compliance Demonstration	Recordkeeping	Notifications and Reporting [a]
E. §63.825(b)(5) Average HAP content of materials applied ≤0.20 kg HAP per kg solids, as applied	Compliance demonstration (monthly) [§63.825(b)(5)]; see Condition 4E HAP content analysis [§63.827(b)(2)]; see Condition 5A Solids content analysis [§63.827(c)(2)]; see Condition 5B Material usage measurements [§63.825(b)(5)] *(implied by Eq. 7)* See Condition 6	Measurements needed to demonstrate compliance [§§63.829(b)(1) and 63.10(b)(2)(vii)] General recordkeeping [§63.10(b)] See Conditions 7 and 8	Semiannual reports [§§63.830(b)(6) and 63.10(e)(3)] See Condition 9
F. §63.825(b)(6) Total HAP applied less than equivalent allowable HAP	Compliance demonstration (monthly) [§63.825(b)(6) and (e)]; see Condition 4F HAP content analysis [§63.827(b)(2)]; see Condition 5A Solids content analysis [§63.827(c)(2)]; see Condition 5B Calculation of monthly allowable HAP emissions [§ 63.825(e)(1) - (5)] Material usage measurements [§63.825(b)(6)] *(implied by Eq. 8)* See Condition 6	Measurements needed to demonstrate compliance [§§63.829(b)(1) and 63.10(b)(2)(vii)] General recordkeeping [§63.10(b)] See Conditions 7 and 8	Semiannual reports [§§63.830(b)(6) and 63.10(e)(3)] See Condition 9

[a] *The Notification of Compliance Status (NOCS) was required of all facilities (see Section 3.3.1 of this document). For this example, it is assumed that the facility already submitted the NOCS and the Initial Notification.*

APPENDIX D

MONITORING PROTOCOLS FOR THE PRINTING AND FLEXIBLE PACKAGING INDUSTRIES

1.0 INTRODUCTION

1.1 What Is the Purpose of This Appendix?

This Appendix contains monitoring protocols that may serve as the basis for meeting compliance assurance monitoring (CAM) plan requirements, outlined in 40 CFR part 64, for emissions sources that utilize air pollution control systems. There are three ways in particular that these protocols can be used in your State. First, if you adopt them into your State Implementation Plan, sources can then rely upon the protocols as being presumptively acceptable monitoring for CAM compliance purposes [see 40 CFR § 64.4(b)(1)]. Second, to the degree that the source is subject to the monitoring required by Federal standards proposed after November 15, 1990, pursuant to section 111 or 112 of the Act or voluntarily adopts such monitoring requirements that apply to the relevant control device of the source, this would also be presumptively acceptable for CAM compliance [see 40 CFR §64.4(b)(4)]. Finally, a source may use the monitoring protocols with a separate demonstration of how the alternative monitoring approach would meet the CAM requirements [see 40 CFR §64.4(a)].

In 40 CFR § 64.3, the CAM rule set forth criteria for compliance assurance monitoring. Owners or operators of affected pollutant specific emissions units are able to design monitoring systems as they wish (and you approve) as long as the monitoring systems are consistent with the CAM rule. This Appendix sets forth protocols we believe are consistent with the CAM rule. You may consider allowing source owners or operators to use these protocols, but these protocols are simply one means of meeting CAM rule requirements. Nothing in this Appendix or the TSD precludes you or source owners or operators from developing other monitoring systems, provided the monitoring systems are consistent with the CAM rule.

While continuous emissions monitoring systems (CEMS) may be appropriate for monitoring outlet concentrations in order to demonstrate compliance with the CAM rule, other monitoring means are also valid. These protocols address monitoring for both the capture systems and air pollution control devices (i.e., the capture and control systems) for identified emissions sources. These protocols are consistent with the criteria of the CAM rule [see 40 CFR § 64.3(a)] and performance criteria [see 40 CFR § 64.3(b)]. The criteria set guidelines for:

1. Designing an appropriate monitoring system, and

2. Setting the appropriate parameter range(s).

The performance criteria require:

1. Data representativeness,

2. A method to confirm the operational status of the equipment (for new or modified equipment only),

3. Quality assurance and quality control procedures, and

4. Specifications for the monitoring frequency and data collection procedure, including recordkeeping and reporting.

Table D-1 lists the protocols presented in this appendix. Note that separate protocols are presented for capture systems (A – F) and add-on control devices (1 – 4). Also note that the protocols given here may not be applicable for emissions units subject to regulations promulgated after November 1990 (such as subpart KK), since the monitoring required by those rules already provides a reasonable assurance of compliance with the regulations. While individual units may not meet the CAM rule applicability cutoffs for size, or may not be subject to the CAM rule because they are subject to rules promulgated after November 15, 1990, pursuant to 40 CFR § 64.2 (e.g., the Printing and Publishing MACT, the Paper and Other Web Coating MACT), you may find these monitoring protocols useful even when monitoring is required under an applicable requirement. The relevance of the approaches would, of course, depend on the monitoring requirement at issue.

TABLE D-1. LIST OF MONITORING PROTOCOLS INCLUDED IN APPENDIX

Protocol	Type	Source	Key Parameters
A	Capture system inherent to design of operation	Unenclosed flexographic or rotogravure printing press	1. Ductwork integrity and inspections 2. Interlocks on system airflow
B	Capture system inherent to design of operation	Unenclosed flexographic or rotogravure presses; unenclosed coater; unenclosed laminator	1. Ductwork integrity and inspections 2. Monitoring (recording) of indicator of exhaust flow rate (e.g., static pressure)
C	Permanent total enclosure	Press, coater, laminator	1. Enclosure pressure differential 2. Ductwork integrity and inspections
D	Permanent total enclosure or permanent non-total (partial) enclosure	Press, coater, laminator	1. Ductwork integrity and inspections 2. Interlocks on doors, inspections 3. Monitoring (recording) of indicator of exhaust flow rate (e.g., static pressure)
E	Permanent total enclosure or permanent non-total (partial) enclosure	Press, coater, laminator; Controlled emissions less than CAM major source threshold (MST)	1. Ductwork integrity and inspections 2. Self-closing doors & inspections 3. Monitoring (recording) of indicator of exhaust flow rate (e.g., static pressure) or interlock on exhaust flow rate
F	Bypass	Press, coater, laminator	1. Interlock with process, or 2. Indicator of valve position, or 3. Indicator of flow, or 4. Car-seal or lock, and 5. Periodic inspection of integrity
1	Thermal oxidizer	Press, coater, laminator	1. Combustion Chamber temperature 2. Inspections 3. Performance testing once every 5 years 4. Assessment of valve leakage (regenerative units only)
2	Catalytic oxidizer	Press, coater, laminator	1. Catalyst bed inlet temperature 2. Annual assessment of catalyst activity 3. Inspections 4. Performance testing once every 5 years 5. Assessment of valve leakage (regenerative units only)
3	Solvent Recovery	Press, coater, laminator	1. Inlet and outlet solvent concentration 2. Air flow rate
4	Solvent Recovery	Printing operation, coater, laminator	Liquid-liquid material balance

1.2 How Do I Use The Monitoring Protocols?

If a protocol is applicable to a type of source, capture system, or add-on control device used by an owner or operator in your jurisdiction, with your approval, he or she may propose to use the monitoring protocol(s), if the CAM rule applies [see 40 CFR § 64.4(a)]. However, for new or modified monitoring systems, he or she also must submit information on the method to be used to confirm the operational status of the monitoring equipment when it is put into service [see 40 CFR § 64.4(e)].

Should you choose to allow a source owner or operator to select one of the protocols, which are one means of complying with CAM rule requirements, then you should expect that source owner's or operator's CAM submission to mirror the appropriate protocol description given later in this Appendix.

1.3 What if the Process Uses Compliant Inks or Coatings or Intermittently Uses Compliant and Non-compliant Inks and Coatings?

The capture system and air pollution control device monitoring protocols only apply when operating with materials that require control. However, if the process sometimes operates with materials that require control and sometimes with materials that do not require control, and if the control device is bypassed when materials that do not require control are used, we recommend that the position of the bypass valve (damper) that diverts the process exhaust flow away from the air pollution control system be monitored and documented to assure that the air pollution control device is not bypassed while operating with materials that require control.

1.4 What Are the Types of Sources to Which These Monitoring Protocols Apply?

The types of equipment or sources to which these protocols apply are presented in Table D-2.

1.5 How Do I Know If a Protocol Is Applicable to a Certain Source Type, Capture System, and Add-On Control Device?

Table D-2 presents a list of source types and shows the protocols that are applicable for each source type.

1.6 Must Owners or Operators in My Jurisdiction Always Use the Monitoring Protocols Presented in This Appendix?

No. The monitoring protocols presented in this appendix are not mandatory. Pursuant to 40 CFR § 64.4(b)(5), owners and operators in your jurisdiction may choose to use these monitoring protocols. With appropriate justification, other monitoring approaches may be pursued as long as they ultimately meet all of the monitoring criteria for the requirements applicable to their source.

TABLE D-2. SUMMARY OF COMPLIANCE ASSURANCE MONITORING EXAMPLES FOR VOC AND HAP SOURCES

Source	Controlled Potential to Emit		Capture system type	Monitoring Protocol[1]			Comments
	Less than major source threshold	Greater than major source threshold		Capture system	Control device	Bypass	
Unenclosed flexographic or rotogravure press	X	X	Exhaust system inherent to the design of an unenclosed press and dryer	A	1, 2, or 3	F	Capture efficiency inherent to design and operation of press
Unenclosed flexographic or rotogravure press; unenclosed coater; unenclosed laminator	X	X	Exhaust system inherent to the design of an unenclosed coater, unenclosed laminator, or unenclosed press and dryer	B	1, 2, or 3	F	Capture efficiency inherent to design and operation of press, laminator, or coater
Heatset web offset lithographic press	X	X	Exhaust system inherent to the design of an unenclosed press and dryer	Not applicable	1, 2, 3, or 4	F (Not applicable if using Protocol 4)	Only an initial validation of negative flow into the dryer is required to demonstrate capture.
Press, coater, laminator	X		Enclosure	C, D, or E	1, 2, or 3	F	
Press, coater, laminator		X	Enclosure	C or D	1, 2, or 3	F	
Press, coater, laminator	X	X	Unenclosed or enclosed	Not applicable	4	Not applicable	Solvent recovery mass balance addresses overall capture and control.

[1] See Table D-1.

2.0 CAPTURE SYSTEMS

2.1 What Is Capture Efficiency?

Capture efficiency refers to the weight per unit of time of an air contaminant entering a capture system and delivered to a control device divided by the weight per unit time of the air contaminant generated by the source, expressed as a percentage. Various systems may be used to capture emissions and direct them to a control device. For purposes of this appendix, capture systems are classified into three distinct categories. These are:

1. Permanent total enclosure,

2. Permanent non-total enclosure (i.e., hoods and enclosures not meeting permanent total enclosure criteria), and

3. Exhaust system inherent to the design of unenclosed process operations (e.g., the dryer and exhaust system on a central impression (CI) flexographic press).

2.2 What Is a Permanent Total Enclosure?

A permanent total enclosure is an enclosure that completely encompasses a source such that all volatile organic compound (VOC) emissions are contained and directed to a control device. We have established a set of criteria that must be met for an enclosure to qualify as a permanent total enclosure; these criteria are contained in Reference Method 204 – Criteria For and Verification of a Permanent or Temporary Total Enclosure, 40 CFR part 51, Appendix M. If the criteria set forth in this method are met, the capture efficiency may be assumed to be 100 percent and need not be determined. Table D-3 summarizes the permanent total enclosure criteria contained within this rule.

TABLE D-3. PERMANENT TOTAL ENCLOSURE CRITERIA

1.	Any natural draft opening (NDO) shall be at least four equivalent opening diameters from each VOC emitting point;
2.	The total area of all NDOs shall not exceed 5 percent of the surface area of the enclosures four walls, floor, and ceiling;
3.	The average face velocity (FV) of air through all NDOs shall be at least 3,600 m/hr (200 ft/min) (note: a pressure drop of 0.013 mm Hg (0.007 in. w.c) corresponds to a FV of 3,600 m/hr). The direction of flow through all NDOs shall be "into" the enclosure.
4.	All access doors and windows whose areas are not included in the calculation in item No. 2 shall be closed during routine operation of the process; and
5.	All VOC emissions must be captured and contained for discharge through a control device.

2.3 What Is a "Permanent Non-Total (or Partial) Enclosure"?

Enclosures that encompass all or part of a source, but that are not designed to meet permanent total enclosure criteria, and local ventilation hoods or systems (including floor sweeps) that are not inherent to the design of the process, but are installed to improve the capture efficiency of the system, are considered "non-total (partial) enclosures" for the purposes of the protocols outlined in this Appendix. Because of their design, the capture efficiency of a non-total (or partial) enclosures cannot be assumed to be 100 percent. Therefore, their capture efficiency is determined by measurement.

2.4 What Is an "Exhaust System Inherent to the Design of Unenclosed Process Operations?"

In addition to the two types of systems discussed above, a third type of control measure may be used to capture emissions and vent them to a control device. This type of system applies to exhaust ventilation systems inherent to the design of the process equipment. In the printing industry, exhaust systems typically consists of the dryer(s) and associated ductwork that are an integral part of the printers and coaters. Equipment not contained in a permanent total enclosure or a non-total permanent enclosure, that relies solely on the dryer exhaust systems inherent to the process equipment for capture of emissions, is referred to as an "unenclosed" process. The capture efficiency of an unenclosed process cannot be assumed to be 100 percent. Therefore, the capture efficiency is determined by measurement.

2.5 What Are the Key Factors to Consider When Monitoring an Unenclosed Process?

Multicolor in-line and central impression (CI) cylinder presses used in the rotogravure, flexographic, and lithographic industries utilize dryers following the application of each ink, or coating, and/or tunnel dryers. The system of dryer(s), and associated ductwork (dryer system), as well as the airflow through the system, is an integral part of the process as designed by the manufacturer. The dryer systems are designed to operate under negative pressure and once installed do not change significantly. A poorly performing dryer system may not allow proper drying of inks, coatings, primers or adhesives, thereby resulting in performance problems for the applied materials. Furthermore, a properly balanced air system must be maintained in order to assure that the concentration of flammable materials in the exhaust gas is maintained below the lower explosive limit (LEL). We understand that in order to meet fire insurance requirements, it is industry practice for all exhaust ducts that will exceed 25 percent of the LEL level to be fitted with LEL sensors and alarms and with flow sensors that will trigger a shutdown if the flow falls below the no flow sensor setting.

Because the dryer system is an integral part of the process design and operation, the key parameters which can be monitored as indicators of performance include:

1. Exhaust system air flow interlocks,
2. Indicators of exhaust system air flow (e.g., duct static pressure), and
3. Integrity of the duct system from the process to the control device.

Monitoring some or all of these parameters will assure that capture integrity will continue to be maintained as initially verified at installation. Verification of the operational condition of the exhaust system air flow, and inspection of the duct system are key factors to consider for monitoring.

An additional method that may be used to check the proper balance of airflow is the "smoke test." A smoke test utilizes a device that generates visible "smoke;" the smoke will be drawn into the exhaust and captured if the exhaust system is operating properly. For example, this method may be used to check the proper balance of the airflow after replacing dryers that have been removed for maintenance.

2.6 What Indicators of Performance Are Included in the Monitoring Protocols for Unenclosed Processes?

Two monitoring protocols for capture systems inherent to the design of unenclosed processes are included in this appendix. Protocol A addresses monitoring unenclosed presses. The protocol relies on:

1. Inspecting the integrity of the ductwork between the process and control device;

2. Verifying the operational condition of the exhaust system air flow interlocks; and

3. Verifying negative flow by smoke test, as necessary, after maintenance operations.

Protocol B addresses monitoring of the capture system for unenclosed coaters and unenclosed laminators. This protocol also may be used for unenclosed presses. The protocol is similar to Protocol A; however, instead of relying on verification of the operational condition of an exhaust system air flow interlock, an indicator of the exhaust air flow rate is monitored continuously:

1. Inspecting the integrity of the ductwork between the process and control device;

2. Continuously monitoring and recording an indicator of exhaust gas flow (e.g., static pressure) from the process; and

3. Verifying negative flow by smoke test, as necessary, after maintenance operations.

Continuously monitoring and recording an indicator of exhaust gas flow is included to provide an increased level of confidence that the proper airflow rate through the system is being maintained. For the printing processes, maintenance of the proper airflow in each print/dryer station is critical to maintaining print quality. Although maintaining the proper airflow for the dryers associated with the coating and laminating processes is important, such maintenance is not as critical to the quality of the product because multicolor applications are not being applied in rapid succession.

2.7 What Do We Recommend for Capture Efficiency Testing for Heatset Web Offset Lithographic Printing Presses Using Add-on Controls?

An unenclosed heatset web offset lithographic printing press is an example of an unenclosed process operation, but because of the unique properties of heatset lithographic inks, an alternative approach to demonstrating initial capture efficiency and to monitoring capture is provided. As discussed in section 5.5.2.2 of this document, to demonstrate capture efficiency for this type of press, the printer may demonstrate that the dryer is operating at negative pressure relative to the surrounding pressroom. As long as the dryer is operated at negative pressure, the capture efficiency for VOC from the heatset lithographic inks and varnishes (coatings) formulated with low volatility ink oils is assumed to be 100 percent of the VOC (ink oils) volatilized in the dryer. Therefore, no VOC capture efficiency testing need be performed. If negative pressure is not maintained in the oven, the resulting emissions into the press room will be visible smoke. Therefore, no continuous monitoring of a capture system parameter is required for this kind of press. Periodic (e.g., after maintenance) verification of negative flow into the oven is recommended. Conventional heatset lithographic inks and varnishes are paste-type materials. The VOC in these materials are oils with high boiling points, which volatilize only within the dryer. Some ink oils, nominally 20 percent, are not volatilized and remain in the substrate. If other types of coating materials (e.g., fluid) are used on a heatset lithographic press, then capture efficiency testing may be required for the VOC from these materials depending upon the properties of the components.

2.8 What Are the Key Factors to Consider When Monitoring a Permanent Total Enclosure?

Maintaining the integrity of the enclosure and the airflow (ventilation) through the system and the control device are critical to maintaining the performance of a capture system for a permanent total enclosure. The indicators of performance for permanent total enclosures relate to these two factors. For purposes of this discussion, monitoring approaches can be divided into two subcategories:

1. Direct indicators of capture performance by the enclosure (e.g., enclosure differential pressure, natural draft opening (NDO) velocity); and

2. Indicators of system air flow (e.g., duct static pressure) measured downstream of the capture device combined with verifications of system integrity (e.g., self closing doors, various system interlocks, and periodic inspections).

The first approach is straightforward. Monitoring the differential pressure of the enclosure provides a direct indicator of performance. It is the key parameter typically selected as the indicator of performance. Alternatively, linear velocity of airflow through selected NDOs could be monitored.

The second approach relies on monitoring the integrity of the enclosure (including whether doors to the enclosure are properly closed) and the airflow through the system. Techniques to monitor the integrity of the enclosure include periodic inspections, and use of interlocks and/or self-closing mechanisms on doors. Techniques to monitor the system airflow include the use of indicators such as interlocks, duct static pressure, fan amperage, or fan RPM.

The design and construction of an enclosure and its durability vary. Permanent total enclosures typically have personnel doors and equipment access doors. Designs include automated doors with sensors that trigger openings when personnel or equipment approach. Other doors are fitted with “self-closing” devices that cause the door to automatically close after it has been opened. Manually operated doors with no special features also might be used. These types of doors might include alarms to alert the operator if they remain open or might include interlocks resulting in an operation shut down if they remain open for an extended time period. Another design sometimes used for access to the equipment is close-fitting or overlapping plastic strips to cover the access opening.

The design and construction of the enclosure and its durability are factors to consider when selecting the inspection parameters and frequency. For example, an enclosure designed and built in conjunction with the installation of a new process line might essentially consist of a small building around the line with the necessary personnel and equipment access doors. In this case, the doors may be fitted with automatic doors with interlocks that will shut down the process if the doors remain open for more than a specified time period (e.g., five minutes). The integrity and durability of this kind of enclosure is high and only infrequent inspections (e.g., semiannually) should be necessary.

On the other hand, an enclosure built as a retrofit to an existing process line might require use of materials such as plastic strips to fit around overhead piping and electrical wiring. Also, self-closing doors without interlocks or alarms might be used and sections of the wall might be constructed of hanging plastic strips to allow ready access to the machine. This kind of enclosure is more susceptible to degradation (e.g., plastic strips breaking or getting knocked off; malfunction of self-closing door mechanisms going unnoticed or unrepaired), and may warrant more frequent inspection (e.g., daily, weekly, or monthly). The objective is to assure the conditions that establish the enclosure as a permanent total enclosure according to Method 204 are maintained.

Verification of the integrity of the duct between the enclosure and the add-on control device are key elements to monitor for all permanent total enclosures.

2.9 What Are the Indicators of Performance Included in the Monitoring Protocols for Permanent Total Enclosures?

Three monitoring protocols for permanent total enclosures are included in this Appendix. Protocols C and D are applicable to enclosures for any process; Protocol E is applicable only to enclosures for processes with emissions less than the major source threshold (MST) (e.g., 100 tons per year for VOC).

1. Protocol C relies on:

    (a) Continuously monitoring the pressure differential of the enclosure,

(b) Inspecting the operational condition of the bypass damper and verifying bypass operation per one of the procedures presented in the *Bypass Monitoring Protocol* (Protocol F), and

(c) Inspecting the ductwork integrity between the enclosure and add-on control device.

2. Protocol D relies on:

(a) Continuously monitoring an indicator of exhaust air flow rate (e.g., static pressure),

(b) Verifying the operational status of interlocks on enclosure doors,

(c) Inspecting the enclosure integrity,

(d) Inspecting the operational condition of the bypass damper and verifying bypass operation per one of the procedures presented in the *Bypass Monitoring Protocol* (Protocol F), and

(e) Inspecting the ductwork integrity between the enclosure and add-on control device.

3. Protocol E is applicable only to processes with controlled emissions <u>less than</u> the MST. The protocol relies on:

(a) Continuously monitoring an indicator of exhaust air flow rate (e.g., static pressure), or using an air flow interlock to assure a minimum airflow is maintained;

(b) Using self closing door mechanisms;

(c) Inspecting the enclosure integrity;

(d) Inspecting the operational condition of the bypass damper and verifying bypass operation per one of the procedures presented in the *Bypass Monitoring Protocol* (Protocol F); and

(e) Inspecting the ductwork integrity between the enclosure and add-on control device.

2.10 What Are the Key Factors to Consider When Monitoring a Permanent Non-total (Partial) Enclosure?

The key factors to consider when monitoring a permanent non-total enclosure are the same as those considered for monitoring a permanent total enclosure: the air flow through the system, the integrity of the enclosure, and the integrity of the ductwork between the enclosure and the control device. The primary difference between the two is not in the monitoring, but in the fact that the enclosure has not been designed to capture all the emissions and a capture efficiency of 100 percent cannot be claimed. However, as discussed above for permanent total enclosures, the design and construction of enclosures can vary significantly, and, consequently, so can the susceptibility of the integrity of the enclosure. Because non-total enclosures do not meet the minimum design criteria to qualify as permanent total enclosures, the design and construction of permanent non-total enclosures can vary even more widely than for permanent total enclosures. Consequently, more frequent inspections of the integrity of the enclosure are recommended.

Furthermore, some permanent non-total enclosures (as defined for this Appendix) may be comprised of simple local exhaust systems (e.g., hoods and floor sweeps) which have been added to the process and are therefore not inherent to the press or coater design. In these cases, depending on the design of the system, monitoring an indicator of flow (e.g., static pressure or damper position) to the individual local exhaust system may be warranted.

2.11 What Are the Indicators of Performance Included in the Monitoring Protocols for a Permanent Non-total Enclosure?

The protocols for non-total enclosures included in this Appendix are Protocols D and E for enclosures.

2.12 What Are the Key Factors to Consider When Monitoring a Bypass Damper or Valve?

Most controlled presses, coaters, or laminators employ a damper that directs process line exhaust to the control device or to the atmosphere (bypass). Typically these “bypass” dampers are monitored to verify that the exhaust gases are being sent to the control device when the process is in operation, or have an interlock which allows the process to operate only when the exhaust gases are being sent to the control device. In general, process line exhausts are sent to the atmosphere only when the web is disengaged, during startup and shutdown of the process, or when the process is running materials that do not require emissions control. The exhaust system may also be isolated from the control device when the process line is not operating. Since a control device commonly processes emissions from multiple process lines, an isolation damper may be necessary to eliminate bleed-in air from any non-operating lines. Any bypass dampers and isolation dampers must work in concert so that when the exhaust from a process is directed to the control device, the isolation damper is open to receive the flow.

Verification of the operational condition of the bypass damper and verification that the bypass damper or valve is properly positioned to direct the flow to the control device when the process is operating with inks and coatings that must be controlled are key elements to monitor for all permanent total enclosures.

2.13 What Are the Indicators of Performance Included in the Protocols for a Bypass Damper or Valve?

Protocol F is the protocol for bypass dampers or valves and provides several monitoring options, including:

1. An interlock with the process,

2. An indicator of valve position,

3. An indicator of flow, and

4. A car-seal or lock.

Any of these options may be used in conjunction with a periodic (at least annual) inspection of the integrity of the bypass damper or valve.

3.0 ADD-ON CONTROLS

3.1 What Is an Oxidizer?

Oxidizers are combustion systems that control VOC and organic HAP by combusting them to carbon dioxide (CO_2) and water. The design of an oxidation system is dependent on the pollutant concentration in the waste gas stream, type of pollutant, presence of other gases, level of oxygen, and stability of processes vented to the system. Important design factors include residence time (sufficient time for the combustion reaction to occur), temperature (a temperature high enough to ignite the waste-auxiliary fuel mixture), and turbulence (turbulent mixing of the air and waste-fuel). Residence time, temperature, turbulence, and sufficient oxygen concentration govern the completeness of the combustion reaction. Of these, only temperature and oxygen can be significantly controlled after construction. Residence time and turbulence are fixed by oxidizer design.

The efficiency at which VOC and HAP compounds are oxidized is greatly affected by temperature. Because inlet exhaust gas concentrations are well below the LEL to prevent pre-ignition explosions, the exhaust gas must be heated with auxiliary fuel and/or primary oxidizer heat recovery above the auto-ignition temperature. Thermal destruction of organic materials will vary depending on the chemical structure of the solvent. For organic solvents used in this industry, thermal destruction will be effected at combustion temperatures between 400 and 1800 degrees Fahrenheit (°F) depending on the oxidation technology used and the solvent types. Residence time is equal to the oxidizer chamber volume divided by the total flow of flue gases (waste gas flow, added air, and products of combustion). A residence time of 0.2 to 2.0 seconds is common. Turbulence is necessary to ensure that all waste and fuel come in contact with oxygen. In the printing industry, oxidizer systems operate with excess air/oxygen from the process exhaust (above stoichiometric or theoretical amounts) to ensure complete combustion.

Normal operation of an oxidizer should include a controlled operating temperature. Monitoring and controlling the oxidizer operating temperature will provide a good method of ensuring VOC and HAP destruction efficiency.

3.2 What Is the Difference Between a Thermal Oxidizer and a Catalytic Oxidizer?

A catalytic oxidizer is a thermal oxidation system that uses a catalyst to lower the activation temperature of the VOCs in the exhaust stream. By use of a catalyst the oxidation process can be completed in the range of 400 to 700°F, while un-catalyzed thermal oxidizers operate in the range of 1,200 to 1800°F.

Catalytic oxidation control devices are widely used in the surface coating and printing industries to control both VOC and HAP. The following process variables should be considered when applying a catalytic oxidation system: exhaust flow rate of the process being controlled, type and concentration of the pollutants, temperature and oxygen levels of the exhaust stream, and the presence of other gases, poisons, or masking agents.

Catalytic oxidation systems can be designed to accommodate wide ranges of exhaust rates. The system size is dictated by the maximum exhaust rate of the source to be controlled. The concentration of VOC in the exhaust stream can impact the sizing of the catalytic oxidation system. As the concentration of VOC in the exhaust stream increases, the heat released from the oxidation of these VOC also increases. This heat release increases the temperature rise across the catalyst bed. At some point this heat release can cause the exhaust air temperature to exceed the safe operating limits of the catalyst material being used. If this occurs, dilution air can be introduced into the stream to control temperature up to the airflow limit of the system. In most printing and coating applications the desired maximum airflow from the printing and coating operation, not the maximum expected solvent load to the control system, is the factor that determines the unit sizing.

Residence time for catalytic oxidation systems is normally expressed in terms of gas hourly space velocity (GHSV), which is calculated by dividing the cubic feet of exhaust gas per hour processed by the cubic feet of catalyst in the system. Typical GHSVs range from 8,000 to more than 50,000. The lower the GHSV, the greater the surface area of catalyst sites available to promote the oxidation of the VOC in the exhaust stream. As in thermal oxidation systems, residence time, or in this case GHSV, in conjunction with operating temperature impacts the oxidation efficiency. In thermal oxidizers, lower residence times may require higher operating temperatures to achieve the desired oxidation of the VOC. The same can be true for catalytic oxidation systems; higher GHSVs require higher operating temperatures to achieve the desired oxidation levels.

Catalyst activation temperatures can range from 300°F to 1300°F. Catalyst activation temperature is impacted by a wide variety of factors. These factors include the type of catalyst (i.e., base metal, precious metal, hybrid), surface area and density, type of supporting structure (i.e., bead, extruded material, metal or monolith structure), type or species of VOC to be controlled, and the accumulation level of poisons or masking agents. Oxygenated solvents such as alcohols and acetates typically used in the printing and surface coating industries are easily oxidized at relatively low temperatures. Other solvents may require higher temperatures. In some cases, the catalyst operating temperature can be adjusted to compensate for decreases in activity.

Poisons and masking agents in the exhaust stream can contaminate the catalyst and reduce its effectiveness. Poisons and masking agents can be carried into the system with the exhaust gases being treated. Catalyst poisons are defined as contaminants that chemically affect the active catalyst materials rendering them inactive. Catalyst masking agents deactivate a catalyst by coating the active catalyst material thus preventing the VOC from contact with the active catalyst sites. Poisoning and masking of catalyst normally develops over extended periods of operation. Over the many years that catalytic systems have been used, the source of poisons and masking agents have been largely identified and either eliminated or compensated for in the catalytic oxidation system design. Catalyst testing can provide valuable information as to the activity level of the catalyst and help predict the useful life of the catalyst.

Thermal degradation of catalyst is exacerbated as temperatures in the catalyst beds are increased. Most manufacturers of catalytic oxidation systems address this issue by monitoring the catalyst bed outlet temperature. The physical breakdown or attrition of catalyst can occur as a result of loosely packed material abrading against itself or the catalyst containment system. In the case of structured monolith catalyst, vibration or the normal expansion and contraction of the catalyst containment system may cause physical damage.

3.3 What Is the Difference Between a Recuperative Oxidizer and a Regenerative Oxidizer?

Recuperative oxidation systems utilize heat recovery devices configured as either plate or shell and tube type metallic heat exchangers. In a recuperative oxidation system, the increase in heat content of the gases exiting the oxidation process are used to preheat the process exhaust gases prior to entering the oxidation chamber. This type of system can recover from 50 percent to 80 percent of the energy in the system.

Regenerative oxidation systems are designed with a heat recovery device utilizing two or more towers of a ceramic media or other heat exchange media that store and release heat. A valve mechanism is used to alternate the exhaust stream between two or more towers. Energy is recovered by reversing the direction of gas flow through the towers allowing for up to 95 percent recovery of process energy. The ceramic media in these systems may be coated with a catalyst material.

Unlike a recuperative oxidizer, which has a fixed combustion chamber, a regenerative unit has a combustion "zone" in which oxidation occurs. The combustion zone of the unit varies with the VOC loading to the device and the location within the media bed or inter-bed chamber where combustion occurs. The operating temperature is set by establishing a minimum temperature in the media beds or inter-bed chamber that triggers the operation of the auxiliary burner or gas injection system when the temperature reaches the minimum value. Through the use of an array of temperature sensors, the temperature profile of the unit is monitored to verify that the minimum temperature is maintained at some point within the unit. Depending upon flow, VOC loading, and other operating parameters, the highest measured temperature may be at some point within the media beds or in the inter-bed chamber. Because of the complexity of the system, establishing a minimum operating temperature based on a single point within the combustion zone may be difficult or overly restrictive. The owner/operator may elect to monitor multiple temperatures to assure that a minimum temperature is maintained within the combustion zone, or may propose to monitor several temperatures and maintain a minimum average temperature. Some flexibility in defining the operating temperature(s) to be measured and monitored is appropriate for regenerative units.

3.4 What Are the Key Factors to Consider When Monitoring a Thermal Oxidizer?

The key factors to consider are:

1. Operating temperature, and

2. System integrity.

Normal operation of a thermal oxidizer should include a minimum operating temperature. Monitoring and controlling the oxidizer operating temperature will provide a good method of ensuring VOC and HAP destruction efficiency.

3.5 What Are the Indicators of Performance Included in the Protocol for a Thermal Oxidizer?

Protocol 1 addresses monitoring of thermal oxidizers. The monitoring protocol relies on:

1. Continuously monitoring the oxidizer operating temperature (at least one measurement taken and recorded every 15 minutes),

2. Periodic inspection of the oxidizer, and

3. Performance testing once every 5 years.

3.6 What Are the Key Factors to Consider When Monitoring a Catalytic Oxidizer?

The key factors to consider are:

1. Operating temperature (minimum catalyst bed temperature),

2. Catalyst activity (life), and

3. System integrity.

Typically, the temperature at the inlet to the catalyst chamber (bed) is used to monitor and control the oxidizer operation. Most catalytic oxidation systems are set up to measure both the inlet and outlet temperatures of the catalyst chamber. While the differential temperature across the catalyst does provide an indication of catalyst activity, it does not provide a quantifiable indication of the efficiency of the system for operations subject to variable VOC loading, as in some elements of the printing/flexible packaging industry. The primary purpose of the outlet temperature measurement is for protection of the catalyst from overheating. Inlet operating temperatures are based on catalyst manufacturer's recommendations and are proven through compliance emissions testing.

The life of catalyst materials are impacted by poisons, masking agents, thermal degradation and in some cases physical degradation. Poisons and masking agents can be carried into the system with the process exhaust gases. Over the long term, these poisons and masking agents can build up in the catalyst bed and slowly reduce the catalyst activity. Over the many years that catalytic systems have been used, the source of poisons and masking agents have been largely identified and either eliminated or compensated for in the catalytic oxidation system design. Thermal degradation of catalyst is exacerbated as temperatures in the catalyst beds are increased. Most manufacturers of catalytic oxidation systems address this issue by monitoring the catalyst bed outlet temperature. Physical breakdown or attrition of catalyst can occur as a result of loosely packed material abrading against itself or the catalyst containment system. In the case of structured monolith catalyst, vibration or the normal expansion and contraction of the catalyst containment system may also cause physical damage. Periodic catalyst sampling and testing can be conducted to assure that the catalyst activity remains satisfactory. Some manufacturers provide catalyst "core samples" installed in the bed to facilitate removal of a sample for testing.

Also, it is important to monitor the operation of any bypass valve installed as a safety measure which, when activated, could vent emissions directly to the atmosphere.

3.7 What Are the Indicators of Performance Included in the Protocols for a Catalytic Oxidizer?

Protocol 2 addresses monitoring of catalytic oxidizers. The monitoring protocol relies on:

1. Continuously monitoring the catalyst bed inlet temperature (at least one measurement taken and recorded every 15 minutes),

2. Annual assessment (e.g., sampling and testing) of the catalyst activity,

3. Periodic inspection of the oxidizer, and

4. Performance testing once every 5 years.

As discussed in section 3.3 of this appendix, flexibility in defining the temperature(s) to be measured and monitored is appropriate for a regenerative catalytic unit. A regenerative catalytic unit will include more than one catalyst bed and the direction of flow though the beds will be changing as a normal part of operation. Because of the complexity of the system, establishing a minimum operating temperature based on a single measurement point within the combustion zone may be difficult or overly restrictive. The owner/operator may elect to monitor multiple temperatures to assure that a minimum temperature is maintained within the catalytic combustion zone, or may propose to monitor several temperatures and maintain a minimum average temperature. Some flexibility in defining the temperature(s) to be measured and monitored is appropriate for regenerative catalytic units.

3.8 What Are Additional Key Factors to Consider When Monitoring a Regenerative Oxidizer?

An additional key operating factor to consider for regenerative oxidizers is the valve mechanism used to reverse the flow of gases through the towers. It is important to assure that the valves controlling the flow to and from the towers do not leak; leaking valves will allow untreated gases to bypass the oxidizing bed and will result in a reduced control efficiency. Also, the valve timing (the period of time between the combustion and regeneration cycle of a tower) can have a small impact on the overall control device efficiency. Each time the valves reverse flow through the tower, a small portion of untreated gases are back-purged (i.e., bypass treatment). As a result, one expects a small reduction in control efficiency as the valve timing (number of cycles per hour) is increased; or conversely, an increase in efficiency as the valve timing (number of cycles per hour) decreases. Valve timing is part of the process design. Modern oxidizers incorporate systems which automatically control (change) valve timing in order to assist with maintaining the proper regenerative bed/combustion chamber temperature. Consequently, it is not practical, nor is it necessary, to establish and monitor a strict set valve timing. Rather, the valve timing control system should be documented and understood upon installation of the system, and the integrity of the valve system should be verified periodically.

Ongoing monitoring of the valve operating system should be conducted. Activities which could be used to assess valve operation include routine inspection of key parameters of the valve operating system (e.g., solenoid valve operation, air pressure, hydraulic pressure), visual inspection of the valves during internal inspections, and testing of the emissions stream for leakage.

3.9 What Are the Indicators of Performance Included in the Protocols for Regenerative Oxidizers?

The monitoring protocols for thermal and catalytic oxidizers include the following additional monitoring parameters for regenerative units:

1. Assessment of proper closure of valves through periodic (at least annual) inspection or testing, and

2. Periodic (at least annual) documentation of valve timing control system parameters (e.g., minimum and maximum set points) and documentation of any changes made.

3.10 What Are Additional Key Factors to Consider When Monitoring a Recuperative Oxidizer?

An additional key operating factor to consider for recuperative oxidizers is the potential for leakage in the heat exchanger. If the heat exchanger develops leaks, untreated emissions can pass through the heat exchanger to the oxidizer exhaust. The heat exchanger should be inspected or tested for leaks per the manufacturer’s recommendations.

3.11 What Are the Indicators of Performance Included in the Protocols for Recuperative Oxidizers?

The monitoring protocols for thermal and catalytic oxidizers include the following additional monitoring parameter for recuperative units:

- Periodic (at least annual) inspection or testing of the heat exchanger to assess leakage per manufacturer’s recommendations.

3.12 What Is a Solvent Recovery System?

Solvent recovery systems, as used in the printing and flexible packaging industry, consist of two or more adsorber vessels that contain activated carbon. Solvent laden air (SLA) from the manufacturing process is passed through one or more adsorbers. The solvent from the air stream is retained or adsorbed by the carbon as it passes through the bed(s). Cleansed air is released to atmosphere. Once the carbon in an adsorber becomes saturated with solvents, the solvent laden air is routed to an alternate adsorber and the saturated adsorber is regenerated (i.e., the adsorbed solvent is stripped from the carbon). Different mechanisms may be used to regenerate the carbon. In one method, the carbon is heated with steam, which causes the carbon to release the solvent vapors. The steam and solvent vapors from the regenerating adsorber are condensed. Many carbon adsorbers have mechanisms to treat the condensate to separate the solvent from the water. After a period of time regeneration is stopped and the adsorber goes idle while waiting to go back on line. Two or more adsorbers are used to enable continuous operation with one or more vessels adsorbing while another is being regenerated. There are other methods to regenerate the carbon beds; such methods include the use of heated nitrogen as the regeneration gas or vacuum regeneration (placing the adsorber under vacuum to desorb the solvent). These alternate methods are most often used with water-miscible solvents.

3.13 What Are the Key Factors to Consider When Monitoring a Solvent Recovery System?

The key factors to consider when monitoring a solvent recovery system are either:

1. The quantity of solvent recovered, or

2. System operating parameters, including

   (a) System integrity,

   (b) Inlet and outlet solvent concentrations,

   (c) Inlet and outlet air flow rates, and

   (d) Regeneration criteria.

Because the solvent is recovered (and not destroyed as in a thermal incinerator), it is possible to conduct a material balance to determine if emissions limits are being met (simply stated: emissions equal solvent used in the process less solvent recovered). One monitoring approach is to conduct a periodic material balance; typically monthly.

Another approach relies on monitoring the inlet and outlet concentrations and air flows of the adsorber system to provide the information necessary to calculate the control efficiency of the device. If the flow rate to the control device is steady and does not vary significantly, continuously monitoring the air flow rates may not be necessary.

A third monitoring approach is to monitor key operating parameters of the adsorber. For example, a rise in outlet solvent concentration indicates that the adsorption capacity of a bed has been reached. Continuously monitoring the solvent concentration of the treated air exhaust stream can be used to detect the increase in concentration and initiate the switch from the adsorbing to the regenerating phase. An instrument used in this approach is typically referred to as a “breakthrough detector.” A fourth approach is to establish regeneration criteria based on design and performance results and monitor these regeneration criteria. For example, establishing a maximum time between regeneration cycles, as well as the minimum quantity and temperature of the steam used for regeneration during each cycle are parameters that could be monitored. Because this parameter monitoring approach does not rely on a direct measure of the solvent concentration in the treated air exhaust stream, it does not provide as high a level of confidence as the use of a breakthrough detector.

3.14 What Are the Indicators of Performance Included in the Protocols for a Solvent Recovery System?

Two protocols for solvent recovery systems are included in this appendix. Protocol 3 addresses monitoring of solvent recovery system concentrations to determine control device efficiency. Protocol 4 relies on measurement of the solvent recovered and material balance calculation (liquid-liquid mass balance (LLMB)) and serves as both a capture system and control device monitoring protocol (i.e., it addresses the overall capture and control efficiency of the system).

Protocol 3 includes:

1. Adsorption system inspection for component integrity,

2. Continuously monitoring solvent concentration in the inlet and outlet of the carbon adsorption system, and

3. Continuously monitoring air flow rate in the inlet <u>or</u> outlet of the carbon adsorption system.

Protocol 4 references the liquid-liquid material balance procedures of 40 CFR §§ 63.824(b)(1)(i) and 63.825(c)(1). If this liquid-liquid material balance procedure is used, no additional monitoring of the capture system, control device, or bypass damper is required.

Parameter monitoring of regeneration cycle criteria has not been included in this Appendix as a protocol. The CAM rule, 40 CFR part 64, and the Appendix A of the Compliance Assurance Monitoring Technical Guidance Document (CAM TGD) includes several examples of parameter monitoring for carbon adsorbers; one example relies on the use of a breakthrough detector, while another relies on monitoring the vacuum regeneration operating parameters. You should refer to the CAM rule and the CAM TGD if you are interested in reviewing parameter monitoring options for solvent recovery systems.

PROTOCOL A
Capture System for VOC Control: Unenclosed Presses

I. Applicability

A. Emissions Unit

This monitoring protocol is applicable to the following types of emissions units:

- Unenclosed flexographic and rotogravure printing presses.

B. Minimum Design Criteria for Emissions Unit and Capture System

This monitoring protocol may be acceptable if the emissions unit and capture system meet the minimum design criteria identified in this section.

1. Emissions Unit

(a) Utilizes dryers following the application of each ink and/or tunnel dryers,
(b) Has air flow into dryers,
(c) Is maintained and operated as designed by the manufacturer and as tested, and
(d) Has flow sensor(s) (e.g., static pressure) in dryer air flow system with interlock to press.

2. Capture System

Has drying system inherent to the design of the press that is maintained and operated as designed by the manufacturer and as tested.

II. Monitoring Approach

The elements of the monitoring approach, including indicators to be monitored, indicator ranges, and performance criteria are presented in Table A.

III. Rationale for Selection of Performance Indicators

Presses used in the rotogravure and flexographic industries utilize dryers. These dryers are designed to operate under negative pressure and comprise the capture system. The dryer system and the airflow through the system is an integral part of the process designed by the manufacturer. A properly balanced air system must be maintained in order to assure proper drying of the inks and coatings and product quality. Furthermore, a properly balanced air system must be maintained in order to assure that the exhaust gas is maintained well below the LEL. In order to meet fire insurance requirements, most exhaust ducts typically are fitted with LEL sensors (required if LEL goes above 25 percent) and alarms and with flow sensors that will trigger a shutdown if the flow falls below a minimum value, typically a fraction of the LEL. Assuring the flow sensor interlocks are properly set and operating will assure the airflow through the system is properly maintained, the press is operating as designed, and the design capture efficiency is achieved.

Inspections of the ductwork and dampers will ensure their integrity.

When necessary after equipment maintenance, or adjustment, a smoke test will verify capture (negative flow from the atmosphere into the exhaust system) at the test location.

IV. Rationale for Selection of Indicator Ranges

An initial performance test is conducted on the unenclosed press to demonstrate compliance with the capture efficiency required in the air pollution permit or as guaranteed by the manufacturer. The low-flow sensor interlock setting is documented during the capture efficiency test. The exhaust system flow rate also is documented during the capture efficiency test.

The level at which the low-flow sensor interlock activates is established by the manufacturer at the time of installation. It is set at a level to assure proper operation of the press and to maintain operation of the exhaust system. Maintaining airflow above this level assures the press is properly operating and provides a reasonable assurance that the capture efficiency is being maintained.

TABLE A. MONITORING APPROACH FOR EMISSIONS CAPTURE FOR UNENCLOSED PRESSES

	Indicator #1	Indicator #2	Indicator #3[a]
I. Indicator	Work Practice	Work Practice	Work Practice
Measurement Approach	Inspect the integrity of the exhaust system from the process to the control device.	Inspect operational condition of all interlocks, including: • between color dryer flow; and • tunnel oven flow.	Use a smoke stick or equivalent approach to assure that the dryer is negative to the surrounding atmosphere.
II. Indicator Range	An excursion is defined as any finding that the integrity of the exhaust system has been compromised.	Establish the interlock set-point at the time of installation Document the setting during the capture efficiency test. An excursion is defined as any finding that any interlocks are inoperative.	Case-by-case determination of appropriate compliance demonstration technique. An excursion is defined as any operation of the press without proper placement of dryer cans being demonstrated.
Corrective Action	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.	Any excursion shall require that the process be immediately shut down and remain down until the problem can be corrected. Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.	Press shall not be operated until proper placement of dryer cans is demonstrated. Each excursion triggers an assessment of the problem, and corrective action.
III. Performance Criteria A. Data Representativeness	Properly positioned dampers and leak free ductwork will assure that all of the normally captured exhaust will reach the control device. Inspections will identify problems.	Properly operating interlocks will assure that dampers are correctly positioned. Inspections will identify problems.	Monitoring approach will assure the dryer is set to properly contain supply air.
B. Verification of Operational Status	Inspection records.	Inspection records.	Not applicable.
C. QA/QC Practices and Criteria		Validate set-point of between color dryer and tunnel oven exhaust flow sensors by measuring static pressure (or flow), as appropriate, annually.	

TABLE A. (CONTINUED)

	Indicator #1	Indicator #2	Indicator #3[a]
D. Monitoring Frequency	Semiannually.	Annually.	Whenever the location of the dryer is disrupted. (This may not be necessary for two piece dryers.)
Data Collection Procedure	Record results of inspections and observations.	Record results of inspections and observations	Not applicable
Averaging Period	Not applicable.	Not applicable.	Not applicable.
E. Recordkeeping	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.
F. Reporting	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.
Frequency	Semiannually.	Semiannually.	Semiannually.

[a] Indicator #3 is only necessary for unenclosed presses with variable placement settings for the between color dryer cans.

PROTOCOL B
Capture System for VOC Control:
Unenclosed Presses, Coaters, and Laminators

I. Applicability

A. Emissions Unit

This monitoring protocol is applicable to the following types of emissions units:

- Unenclosed flexographic or rotogravure presses; unenclosed coaters, and unenclosed laminators.

B. Minimum Design Criteria for Emissions Unit and Capture System

This monitoring protocol may be acceptable if the emissions unit and capture system meet the minimum design criteria identified in this section.

1. Emissions Unit

(a) Has air flow into dryers,
(b) Is maintained and operated as designed by the manufacturer and as tested, and
(c) Has flow sensor(s) (e.g., static pressure) in dryer air flow system.

2. Capture System

Has drying system inherent to design of the process line (press, coater, and or laminator) that is maintained and operated as designed by the manufacturer and as tested.

II. Monitoring Approach

The elements of the monitoring approach, including indicators to be monitored, indicator ranges, and performance criteria are presented in Table B.

III. Rationale for Selection of Performance Indicators

Presses used in the rotogravure and flexographic industries utilize dryers. These dryers are designed to operate under negative pressure and comprise the capture system. The dryer system and the airflow through the system are integral parts of the process designed by the manufacturer. A properly balanced air system must be maintained in order to assure proper drying of the inks and coatings and product quality. Furthermore, a properly balanced air system must be maintained in order to assure that the exhaust gas is maintained below the LEL.

Unenclosed coaters and laminators are designed with a capture system for the application area and dryers which operate under negative pressure; these components comprise the capture system for an unenclosed laminator or coater. The capture, dryer and exhaust system and the airflow through the system are parts of the process designed by the manufacturer. A properly balanced air system must be maintained in order to assure that the exhaust gas is maintained below the LEL of the inks or coatings.

Continuously monitoring an indicator of flow (e.g., static pressure) and maintaining the flow at the proper level provides a reasonable assurance that the capture efficiency is being maintained.

Inspections of the ductwork and dampers will ensure their integrity.

When necessary after equipment maintenance, or adjustment, a smoke test will verify capture (negative flow from the atmosphere into the exhaust system) at the test location.

IV. Rationale for Selection of Indicator Ranges

An initial performance test is conducted on the unenclosed press, laminator, or coater to demonstrate compliance with the capture efficiency required in the air pollution permit or as guaranteed by the manufacturer. The exhaust system flow rate is measured and documented during the capture efficiency test. An indicator of the flow is monitored during the performance test.

The selected indicator range for the indicator of flow is greater than 85 percent of the value measured during the performance test.

TABLE B. MONITORING APPROACH FOR EMISSIONS CAPTURE FOR UNENCLOSED COATERS AND LAMINATORS

	Indicator #1	Indicator #2	Indicator #3
I. Indicator	Work Practice	Exhaust flow	Work Practice
Measurement Approach	Inspect the integrity of the exhaust system from the process to the control device.	Continuously monitor an indicator of flow of the process line exhaust system. Monitor either the static pressure, or a direct measure of flow.	Use a smoke stick or equivalent approach to assure that the dryer is negative to the surrounding atmosphere.
II. Indicator Range	An excursion is defined as any finding that the integrity of the exhaust system has been compromised.	Establish the indicator range at a value greater than 85 percent of the average value measured during the most recent capture efficiency performance test Establish the indicator range based upon the test data, historical data, and engineering judgment.	Case-by-case determination of appropriate compliance demonstration technique. An excursion is defined as any operation of the process without demonstration of negative flow into the dryer or application area capture system after the exhaust system is disrupted.
Corrective Action	Each excursion triggers an inspection, corrective action and a reporting requirement.	Each excursion triggers an inspection, corrective action and a reporting requirement.	Process shall not be operated until negative flow into the dryer system or application area capture system is demonstrated. Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.

TABLE B. (CONTINUED)

	Indicator #1	Indicator #2	Indicator #3
III. Performance Criteria A. Data Representativeness	Properly positioned dampers and leak free ductwork will assure that all of the normally captured exhaust will reach the control device. Inspections will identify problems.	Continuously monitoring an indicator of flow will assure that adequate flow to achieve the designed capture rate is maintained.	Monitoring approach will assure the dryer is set to properly contain supply air, and that the airflow is into the application area capture system.
B. Verification of Operational Status	Inspection records.	Upon installation, compare to measured flow using a standard flow measurement technique (e.g., EPA Method 2) per manufacturer's instructions.	Not applicable.
C. QA/QC Practices and Criteria	Not applicable.	Confirm proper operation and calibration of sensor annually. • Static pressure: compare to calibrated meter or manometer, or • Flow sensor: compare to a measured value using a standard method (e.g., EPA Method 2).	Not applicable.
D. Monitoring Frequency	Semiannually.	At least 4 times per hour.	Whenever the application area capture system or dryer exhaust system is disrupted.
Data Collection Procedure	Record results of inspections and observations.	Data acquisition system or strip chart or circular recorder.	Not applicable.
Averaging Period	Not applicable.	1-hr.	Not applicable.
E. Recordkeeping	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.
F. Reporting	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.
Frequency	Semiannually.	Semiannually.	Semiannually.

TABLE B. (CONTINUED)

PROTOCOL C
Capture System for VOC Control: Permanent Total Enclosures

I. Applicability

A. Emissions Unit

This protocol is applicable to the following types of emissions units:

1. Printing presses, and

2. Coating and laminating operations.

B. Minimum Design Criteria for Emissions Unit and Capture System

This monitoring protocol may be acceptable if the emissions unit and capture system meet the minimum design criteria identified in this section.

1. Emissions Unit

The VOC emitting portions of the process unit are contained within the enclosure.

2. Capture System

Permanent Total Enclosure: a permanently installed enclosure that completely surrounds a source of emissions such that all VOC emissions are captured and contained for discharge to a control device. The enclosure shall be designed and operated in accordance with the criteria in USEPA Method 204. A capture efficiency of 100 percent is assumed for a permanent total enclosure.

II. Monitoring Approach

The elements of the monitoring approach, including indicators to be monitored, indicator ranges, and performance criteria are presented in Table C.

III. Rationale for Selection of Performance Indicators

Maintaining the enclosure under sufficient negative pressure at all times assures that the capture efficiency is maintained; therefore, monitoring the differential pressure across the enclosure provides an indicator of performance.

IV. Rationale for Selection of Indicator Ranges

The selected indicator range is a differential pressure of less than −0.007 inches of water column (in. w.c.). This indicator range is based upon Method 204 criteria. A differential pressure of −0.007 in. w.c. is considered equivalent to a face velocity of 200 feet per minute (ft/min) for natural draft openings (NDO). Alternatively, the differential pressure can be established at a value demonstrated during a certification test as sufficient to meet the 200 ft/min face velocity at all NDOs.

TABLE C. MONITORING APPROACH FOR PERMANENT TOTAL ENCLOSURES UTILIZING PRESSURE DIFFERENTIAL

	Indicator # 1	Indicator #2
I. Indicator	Pressure differential	Work Practice
Measurement Approach	Monitor pressure differential across the enclosure wall and the surrounding atmosphere.	Inspect the integrity of the exhaust system from the process to the control device, and the integrity of the enclosure.
II. Indicator Range	An excursion is defined as a pressure differential of less than −0.007 in. w.c. for 5 consecutive minutes; alternatively, a smaller differential (i.e., less than −0.007 in. w.c.) can be used as the indicator if such a differential is demonstrated as adequate to qualify the permanent total enclosure with Method 204 criteria. Alternatively, a three hour average value can be used as the indicator range.	An excursion is identified as any finding that the integrity of the exhaust system ductwork, or the enclosure have been compromised.
Corrective Action	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.
III. Performance Criteria		
A. Data Representativeness	A measure of the pressure differential at the interface between the wall of the enclosure and surrounding atmosphere assures that the permanent total enclosure is maintained under negative pressure.	Properly positioned dampers, leak-free ductwork and a leak-free enclosure will assure that all of the exhaust will reach the control device. Inspections will identify problems.
B. Verification of Operational Status	Not applicable.	Inspection records.
C. QA/QC Practices and Criteria	Validation of instrument calibration conducted annually. Compare to calibrated meter, or calibrate using pressure standard, or according to manufacturer's instructions.	Not applicable.

TABLE C. (CONTINUED)

	Indicator # 1	Indicator #2
D. Monitoring Frequency	Monitor continuously.	Semiannually
Data Collection Procedure	Record continuously on a chart or electronic media.	Record results of inspections and observations.
Averaging Period	Not applicable if using any measured value as the indicator; Three hours if using 3-hour average as the indicator.	Not applicable.
E. Recordkeeping	Maintain for a period of 5 years records of data and of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.
F. Reporting	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.
Frequency	Semiannually.	Semiannually.

PROTOCOL D
Capture System for VOC Control: Enclosures

I. Applicability

A. Emissions Unit

This protocol is applicable to the following types of emissions units:

1. Printing presses, and

2. Coating and laminating operations.

B. Minimum Design Criteria for Emissions Unit and Capture System

This monitoring protocol may be acceptable if the emissions unit and capture system meet the minimum design criteria identified in this section.

1. Emissions Unit

The VOC emitting portions of the process unit are contained within the permanent enclosure.

2. Capture System

Permanent Total Enclosure: a permanently installed enclosure that completely surrounds a source of emissions such that all VOC emissions are captured and contained for discharge to a control device. A capture efficiency of 100 percent is assumed for a permanent total enclosure.

(a) The enclosure shall be designed and operated in accordance with the criteria in USEPA Method 204,
(b) Any doors on the enclosure shall be equipped with sensors that are interlocked to the process operation, and
(c) The capture system shall include an indicator of flow exhausted from the permanent total enclosure (e.g., static pressure).

Permanent non-total enclosure: a permanently installed enclosure that does not meet permanent total enclosure criteria. An enclosure that does not meet permanent total enclosure criteria must be tested to determine the capture efficiency.

(a) Any doors on the enclosure shall be equipped with sensors that are interlocked to the process operation, and
(b) The capture system shall include an indicator of flow exhausted from the enclosure (e.g., static pressure).

II. Monitoring Approach

The elements of the monitoring approach, including indicators to be monitored, indicator ranges, and performance criteria are presented in Table D.

III. Rationale for Selection of Performance Indicators

If the integrity of the enclosure and exhaust flow are maintained, the capture system will achieve the design capture efficiency. The selected parameters assure the integrity of the enclosure is maintained and that the exhaust flow is maintained.

Inspections of the enclosure will provide the necessary information to assure the integrity of the enclosure is maintained. Interlocks on all doors will assure that doors remain in a closed position during process operation

An indicator of flow in the enclosure exhaust system will assure the airflow through the system is (1) maintained at the minimum level necessary to meet permanent total enclosure criteria or (2) maintained at the level demonstrated during the capture system performance test of enclosures not meeting permanent total enclosure criteria.

IV. Rationale for Selection of Indicator Ranges

The indicator range established for the permanent total enclosure flow is selected based upon design criteria (minimum flow necessary to maintain required average face velocity at natural draft openings) and historical data during normal operation. The indicator range for enclosures not meeting permanent total enclosure criteria is selected based upon the airflow demonstrated during the required capture system performance test.

The selected indicator for the door interlocks is 5 minutes. Five minutes is sufficient time for ingress/egress to allow necessary activities to occur; a door remaining open for longer than 5 minutes during normal operation is indicative of a problem requiring corrective action.

The design and construction of enclosures can vary significantly and, consequently, so can the susceptibility of the integrity of the enclosure. The design and construction of enclosures not meeting permanent total enclosure criteria can vary even more widely than for permanent total enclosures; consequently, for enclosures that do not meet permanent total enclosure criteria, more frequent monitoring of the capture system integrity is recommended.

TABLE D. MONITORING APPROACH FOR ENCLOSURES UTILIZING AN INDICATOR OF FLOW, DOOR INTERLOCKS, AND ROUTINE INSPECTIONS

	Indicator #1	Indicator #2	Indicator #3
I. Indicator	Enclosure Exhaust Flow	Door Position Interlocks	Work Practice
Measurement Approach	A flow sensor (e.g., flow meter, static pressure measurement) is used as an indicator to monitor the total exhaust flow rate from the enclosure.	Doors shall be fitted with a door position monitor with a timer and interlock to the process.	Inspect the integrity of the exhaust system from the process to the control device, and the integrity of the enclosure.
II. Indicator Range	Permanent total enclosure: The indicator range is established at, or above, the level representative of the minimum flow necessary to meet permanent total enclosure criteria (minimum average NDO flow rate). Enclosure not meeting permanent total enclosure criteria: The indicator range is established at, or above, the level demonstrated during the required capture system performance test.	An excursion is identified as any finding that an interlock is inoperative. The process shall shutdown after five minutes of the enclosure door being open.	An excursion is identified as any finding that the integrity of the exhaust system ductwork, or the enclosure have been compromised.
Corrective Action	Any excursion triggers corrective action and a reporting requirement.	Any excursion shall require that the process be immediately shut down until the problem can be corrected.	Each excursion triggers an inspection, corrective action and a reporting requirement.
III. Performance Criteria			
A. Data Representativeness	Continuously monitoring an indicator of flow assures the minimum required flow rate from the enclosure is maintained and the enclosure is maintained under negative pressure.	Properly operating door interlocks will assure that the doors are closed during process operation.	Properly positioned dampers, leak free ductwork and enclosure will assure that all of the exhaust will reach the control device. Inspections will identify problems.
B. Verification of Operational Status	The instrument is installed and calibrated according to the manufacturer's instructions. EPA Method 2[a] is used to verify the flow rate at (or near) the established indicator range.	Not applicable.	Inspection records.

TABLE D. (CONTINUED)

	Indicator #1	Indicator #2	Indicator #3
C. QA/QC Practices and Criteria	Annually verify that the instrument used is reading accurately. Use Method 2[a] to verify the flow rate and relationship of the flow indicator to flow rate.	Check operation of interlocks semiannually.	Not applicable.
D. Monitoring Frequency	Measured continuously.	Measured continuously.	Semiannually.[b]
Data Collection Procedure	Record on strip chart or electronic data system	Record results of any excursion	Record results of inspections and observations
Averaging Period	Not applicable (1-hr average also may be used)	Not applicable	Not applicable
E. Recordkeeping	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.
F. Reporting	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.
Frequency	Semiannually.	Semiannually.	Semiannually.

[a] Method 2 may be acceptable; however, other flow measurement methods may be used to verify flow rates and sensor operation upon agreement by the permitting agency

[b] For enclosures that do not meet permanent total enclosure criteria, more frequent inspections of the integrity of the capture system are required. The minimum frequency is quarterly.

PROTOCOL E
Capture System for VOC Control: Enclosures

I. Applicability

A. Emissions Unit

This protocol is applicable to the following types of emissions units:

1. Printing presses with a controlled potential to emit less than the major source threshold of the pollutant (VOC or HAP), and

2. Coating and laminating operations with a controlled potential to emit less than the major source threshold of the pollutant (VOC or HAP).

B. Minimum Design Criteria for Emissions Unit and Capture System

This protocol may be acceptable if the emissions unit and capture system meet the minimum design criteria identified in this section.

1. Emissions Unit

The VOC emitting portions of the process unit are contained within the permanent enclosure.

2. Capture System

Permanent Total Enclosure: a permanently installed enclosure that completely surrounds a source of emissions such that all VOC emissions are captured and contained for discharge to a control device. A capture efficiency of 100 percent is assumed for a permanent total enclosure.

(a) The enclosure shall be designed and operated in accordance with the criteria in USEPA Method 204,
(b) All doors on the enclosure shall be equipped with self-closing doors or sensors that are interlocked to the process operation, and
(c) The capture system shall include an indicator of flow exhausted from the permanent total enclosure (e.g., static pressure).

Permanent non-total enclosure: a permanently installed enclosure that does not meet permanent total enclosure criteria. An enclosure that does not meet permanent total enclosure criteria must be tested to determine the capture efficiency.

(a) All doors on the enclosure shall be equipped with self-closing doors or sensors that are interlocked to the process operation, and

(b) The capture system shall include an indicator of flow exhausted from the enclosure (e.g., static pressure).

II. Monitoring Approach

The elements of the monitoring approach, including indicators to be monitored, indicator ranges, and performance criteria are presented in Table E.

III. Rationale for Selection of Performance Indicators

If the integrity of the enclosure and exhaust flow are maintained, the enclosure will achieve the design capture efficiency. The selected parameters provide a reasonable assurance that the integrity of the enclosure is maintained and that the exhaust flow is maintained.

Inspections of the enclosure will provide the necessary information to assure the integrity of the enclosure is maintained. Self-closing mechanisms on all doors will provide a reasonable assurance that doors will remain in a closed position during process operation. Self-closing doors provide a lower level of confidence than door interlocks (see Protocol D). However, because this protocol is applicable only to sources with post control emissions of less than the major source threshold, the level of confidence is considered acceptable.

An indicator of flow in the enclosure exhaust system will assure the airflow through the system is (1) maintained at the minimum level necessary to meet permanent total enclosure criteria or (2) maintained at the level demonstrated during the capture system performance test of enclosures not meeting permanent total enclosure criteria. Flow sensor interlocks may be used, in lieu of continuously recording an indicator of flow, to assure the airflow through the system is properly maintained at a minimum level.

IV. Rationale for Selection of Indicator Ranges

The indicator range established for the permanent total enclosure flow is selected based upon design criteria (minimum flow necessary to maintain required average face velocity at natural draft openings) and historical data during normal operation. The indicator range for enclosures not meeting permanent total enclosure criteria is selected based upon the airflow demonstrated during the required capture system performance test.

The design and construction of enclosures can vary significantly and, consequently, so can the susceptibility of the integrity of the enclosure. The design and construction of enclosures not meeting permanent total enclosure criteria can vary even more widely than for permanent total enclosures; consequently, for enclosures that do not meet permanent total enclosure criteria, more frequent monitoring of the capture system integrity is recommended.

TABLE E. MONITORING APPROACH FOR ENCLOSURE UTILIZING AN INDICATOR OF FLOW, AND ROUTINE INSPECTIONS

	Indicator #1	Indicator #2	Indicator #3
I. Indicator	Enclosure Exhaust Flow	Door Position	Work Practice
Measurement Approach	A flow sensor (e.g., flow meter, static pressure measurement) is used to monitor the total exhaust flow rate from the enclosure. The indicator of flow is continuously recorded or, alternatively, a "low flow" value is established and a process interlock is set at this value.	Door position and operation are periodically inspected, or doors are fitted with a door position monitor with a timer and interlock to the process.[b]	Inspect the integrity of the exhaust system from the process to the control device, and the integrity of the enclosure.
II. Indicator Range	Permanent total enclosure: The indicator range is established at, or above, the level representative of the minimum flow necessary to meet permanent total enclosure criteria (minimum average NDO flow rate). Enclosure not meeting permanent total enclosure criteria: The indicator range is established at, or above, the level demonstrated during the required capture system performance test	Door interlocks: An excursion is identified as any finding where the interlocks are inoperative. Self-closing doors: An excursion is identified as any finding where self closing doors are inoperative.	An excursion is identified as any finding that the integrity of the ductwork or the enclosure have been compromised.
Corrective Action	Any excursion triggers corrective action and a reporting requirement.	Any excursion shall require that the process be immediately shut down until the problem can be corrected.	Each excursion triggers an inspection, corrective action and a reporting requirement.
III. Performance Criteria A. Data Representativeness	Continuously monitoring an indicator of flow assures the minimum required flow rate from the enclosure is maintained and the enclosure is maintained under negative pressure.	Properly operating self-closing doors, or door interlocks will ensure that the doors are closed during process operation.	Properly positioned dampers, leak free ductwork and enclosure will assure that all of the exhaust will reach the control device. Inspections will identify problems.
B. Verification of Operational Status	The instrument is installed and calibrated according to the manufacturer's instructions. EPA Method 2[a] is used to verify the flow rate at (or near) the established indicator range.	Not applicable.	Inspection records.

TABLE E. (CONTINUED)

	Indicator #1	Indicator #2	Indicator #3
C. QA/QC Practices and Criteria	Annually verify that the instrument used is reading accurately. Use Method 2[a] to verify the flow rate and relationship of flow indicator to flow rate.	Not applicable.	Not applicable.
D. Monitoring Frequency	Measured continuously.	Interlocks: Measured continuously. Self-closing doors: weekly inspection.[b]	Semiannually.[c]
Data Collection Procedure	Record on strip chart or electronic data system; or if flow interlock is used, record results of any excursion, (i.e. when low flow interlock is activated)	Record results of any excursion.	Record results of inspections and observations.
Averaging Period	Not applicable for interlock; 1-hr average may be used for continuously recorded value.	Not applicable.	Not applicable.
E. Recordkeeping	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and corrective actions taken in response to excursions.
F. Reporting	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.
Frequency	Semiannually.	Semiannually.	Semiannually.

[a] Method 2 may be acceptable; however, other flow measurement methods may be used to verify flow rates and sensor operation upon agreement by the permitting agency

[b] If self-closing doors (or doors with an interlock sensor) are not used on the enclosure, more frequent inspections are required. The recommended inspection frequency is daily. An excursion is any inspection identifying doors remaining in the open position except during periods of egress and ingress while the source is in operation. For access openings utilizing close fitting plastic strips, weekly inspections are required. An excursion is any inspection identifying access areas with missing or damaged strips.

[c] For enclosures that do not meet permanent total enclosure criteria, more frequent inspections of the integrity of the capture system are required. The minimum frequency is quarterly.

PROTOCOL F
Bypass Indication

I. Applicability

This protocol is applicable to all emissions units (i.e., printing, coating or laminating lines) with a bypass damper (or valve) installed in the exhaust gas capture system that allows the exhaust gas to be diverted away from the air pollution control device to atmosphere.

This protocol also is applicable to any bypass damper or valve installed at the air pollution control device, proper; i.e., an emergency bypass.

This protocol does not apply to emissions units (i.e., printing, coating, or laminating) that never are required to utilize the air pollution control system (i.e., emissions units processing compliant coatings or uncontrolled emissions units).

II. Monitoring Approach

Each bypass damper located in the exhaust gas capture system between the process unit (work station) and the air pollution control device is monitored using one of the following procedures:

A. Install, calibrate, maintain and operate a flow control position indicator that provides a record indicating whether the exhaust stream from the dryer was directed to the control device or was diverted from the control device. The time and control position should be recorded at least once per hour, as well as every time the flow direction is changed. Install at the entrance to any bypass line.

B. Ensure that any bypass line valve or damper is in the closed position through continuous monitoring of valve position. The monitoring system shall be inspected at least once every month to ensure that it is functioning properly.

C. Use an automatic shutdown system in which the press is idled and printing is ceased when flow is diverted away from the control device to any bypass line. The automatic system shall be inspected at least once every month to ensure proper functioning.

D. Secure a bypass line valve in the closed position with a car-seal or a lock-and-key type configuration; a visible inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve or damper is maintained in the closed position and the exhaust stream is not diverted through the bypass line.

Each bypass damper or valve is inspected at least annually to ensure proper operation of the valve or damper.

III. Rationale for Selection of Monitoring Approach

The CAM rule (64.3 (a)(2)) requires that "unless stated otherwise, by an applicable requirement, the owner or operator shall monitor indicators to detect bypass of the control device (or capture system) to the atmosphere, if such bypass of the control device can occur based on the design of the pollutant-specific emissions unit." Most controlled presses, coaters, or laminators employ a damper that directs process line exhaust to the control device or to the atmosphere (bypass). These "bypass" dampers need to be monitored to verify that the exhaust gases are being sent to the control device when the process is in operation, or to determine when the emissions are being exhausted to the control device for intermittently controlled work stations.

IV. Indicator Range and Excursion

An excursion is defined as a finding that the bypass monitoring procedure has not been followed, the monitoring system is not operable, or that a required bypass damper or monitoring system inspection has not been conducted. Excursions trigger corrective action and a reporting requirement.

PROTOCOL 1
Thermal Oxidizers

I. Applicability

This monitoring protocol is applicable to thermal oxidizers controlling VOC and organic HAP emissions from presses, coating operations, and laminating operations in the printing and publishing and flexible packaging industries.

This monitoring protocol addresses monitoring of the control device operation, only, and does not address monitoring required of capture systems associated with the individual process units. (See associated protocols for capture systems.)

II. Monitoring Approach

A. The monitoring approach is comprised of:

1. Continuous monitoring and recording of combustion zone temperature with a thermocouple system,

2. Periodic internal and external inspection of the structural integrity of the control devices, and

3. Periodic emissions performance tests.

B. For regenerative thermal oxidizers, the monitoring approach includes the following additional items:

1. Periodic assessment of valves for leakage, and

2. Documentation of the valve timing system design at the time of performance testing and documentation of any changes made to the design or operation of the system.

C. For recuperative thermal oxidizers, the monitoring approach includes the following additional item:

- Periodic assessment of the heat exchanger for leakage.

The elements of the monitoring approach, including indicators to be monitored, indicator ranges, and performance criteria, are presented in Table 1.

III. Rationale for Selection of Performance Indicators

The oxidizer operating temperature was selected because it is indicative of the thermal oxidizer's operation. By maintaining the operating temperature at or above a minimum value, a desired level of control efficiency can be expected to be maintained. If the operating temperature decreases significantly, complete combustion may not occur.

To further ensure consistent VOC oxidation, the structural integrity of the oxidizer should be checked periodically. This will indicate any problems with oxidizer integrity that could result in decreased oxidizer performance or efficiency.

For regenerative units, the chamber sequencing valves will be checked periodically to be sure that they are properly positioned during each heat recovery heating and cooling cycle. This will avoid the leakage of VOC to the oxidizer stack if the valves are not functioning properly. The design and operation of the chamber sequencing valves timing system will be documented during the performance test and verified during periodic inspections. This will identify changes in operation that might impact control efficiency.

An emissions performance test on the oxidizer is conducted once every 5 years to demonstrate compliance with permit conditions (i.e., percent destruction efficiency).

IV. Rationale for Selection of Indicator Ranges

The selected indicator range for the oxidizer operating temperature is established based upon demonstrated performance during a performance test.

The minimum required operating temperature of the oxidizer is established at the operating temperature maintained during a performance test. The thermal oxidation system includes a temperature controller that maintains the desired operating temperature by using an auxiliary burner or natural gas injection system. The temperature controller is set to maintain a temperature at or above the established indicator range.

A regenerative thermal oxidizer does not have a single combustion chamber; it has a combustion “zone” (comprised of the media beds and inter-bed chamber) in which oxidation occurs. The combustion zone of the unit varies with the VOC loading to the device and where within the media bed or inter-bed chamber combustion occurs. The operating temperature is set by establishing a minimum temperature in the media beds or inter-bed chamber that triggers the operation of the auxiliary burner or gas injection system when the temperature reaches the minimum value. Through the use of an array of temperature sensors, the temperature profile of the unit is monitored to verify that the minimum temperature is maintained at some point within the unit. Depending upon flow, VOC loading, and other operating parameters, the highest measured temperature may be at some point within the media beds or in the inter-bed chamber. Because of the complexity of the system, establishing a minimum operating temperature based on a single point within the combustion zone may be difficult or overly restrictive. The owner/operator may elect to monitor multiple temperatures to assure that a minimum temperature is maintained within the combustion zone, or may propose to monitor several temperatures and maintain a minimum average temperature. Some flexibility in defining the operating temperature(s) to be measured and monitored as the indicator of performance is appropriate for regenerative units.

TABLE 1. MONITORING APPROACH FOR THERMAL OXIDIZER

	Indicator #1	Indicator #2	Indicator #3
I. Indicator	Oxidizer operating temperature.	Work practice/inspection.	Performance test
Measurement Approach	Continuously record the operating temperature of the oxidizer combustion zone.	Inspect internal and external structural integrity of oxidizer to ensure proper operation.[b, c]	Conduct emissions test to demonstrate compliance with permitted destruction efficiency.
II. Indicator Range	An excursion is identified as a measurement of 50°F less than the average temperature demonstrated during the most recent compliance demonstration, or as any three-hour period when the average temperature is 50°F less than the average temperature demonstrated during the most recent compliance demonstration.	An excursion is identified as any finding that the structural integrity of the oxidizer has been jeopardized and it no longer operates as designed.	An excursion is identified as any finding that the oxidizer does not meet the permitted destruction efficiency.
Corrective Action	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.
III. Performance Criteria			
A. Data Representativeness	Any temperature-monitoring device employed to measure the oxidizer combustion zone temperature shall be accurate to within 0.5% of temperature measured or ±5°F°, whichever is greater.	Inspections of the oxidizer system will identify problems.	A test protocol shall be prepared and approved by the regulatory Agency prior to conducting the performance test.
B. Verification of Operational Status	Temperatures recorded on chart paper or electronic media.	Inspection records.	Not applicable.
C. QA/QC Practices and Criteria	Validation of temperature system conducted annually. Acceptance criteria ± 20°F.[a]	Not applicable.	EPA test methods approved in protocol.

TABLE 1. (CONTINUED)

	Indicator #1	Indicator #2	Indicator #3
D. Monitoring Frequency	Measured continuously	• External inspection – quarterly. • Internal inspection – annually [b, c, d]	Once every 5 years.
Data Collection Procedure	Recorded at least every 15-minutes on a chart or electronic media.	Record results of inspections and observations.	Per approved test method.
Averaging Period	Not applicable if using any measured value as indicator; Three hours if using 3-hour average as indicator.	Not applicable.	Not applicable.
E. Record Keeping	Maintain for a period of 5 years records of chart recorder paper or electronic media and corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and corrective actions taken in response to excursions.	Maintain a copy of the test report for 5 years or until another test is conducted. Maintain records of corrective actions taken in response to excursions.
F. Reporting	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.	Submit test protocol and notification of testing to Agency 30 days prior to test date. Submit test report 60 days after conducting a performance test.
Frequency	Semiannually.	Semiannually.	For each performance test conducted.

[a] Facility to maintain Standard Operating Procedure on-site for verifying accuracy of system.
[b] Internal inspection of regenerative units should include annual assessment of valves for leakage; this assessment may be comprised of an internal inspection, or other method of assessment for leakage.
[c] Internal inspection of recuperative units should include annual assessment of heat exchanger for leakage (this assessment may be comprised of an internal inspection, or other method of assessment for leakage.)
[d] Evaluation of thermal oxidizer's VOC destruction efficiency using a flame ionization analyzer (FIA) for three 20-minute runs, will serve in lieu of an internal inspection. This evaluation does not require submittal of a test protocol to the regulatory agency (or approval by the regulatory agency) or submittal of test reports.

PROTOCOL 2
Catalytic Oxidizers

I. Applicability

This monitoring protocol is applicable to catalytic oxidizers controlling VOC and organic HAP emissions from presses, coating operations, and laminating operations in the printing and publishing and flexible packaging industries.

This monitoring protocol addresses monitoring of the control device operation, only, and does not address monitoring required of capture systems associated with the individual process units. (See associated protocols for capture systems.)

II. Monitoring Approach

A. The monitoring approach is comprised of:

1. Continuous monitoring and recording of the catalyst bed inlet temperature with a thermocouple system,

2. Periodic internal and external inspection of the structural integrity of the control device,

3. Periodic emissions performance tests, and

4. Periodic assessment of catalyst activity.

B. For regenerative catalytic oxidizers, the monitoring approach includes the following additional items:

1. Periodic assessment of valves for leakage, and

2. Documentation of the valve timing system design at the time of performance testing and documentation of any changes made to the design or operation of the system.

C. For recuperative catalytic oxidizers, the monitoring approach includes the following additional item:

- Periodic assessment of the heat exchanger for leakage.

The elements of the monitoring approach, including indicators to be monitored, indicator ranges, and performance criteria, are presented in Table 2.

III. Rationale for Selection of Performance Indicators

The catalyst bed inlet temperature was selected because it is indicative of the effective operation of the catalytic oxidation system. It has been demonstrated that the control efficiency achieved by a catalytic oxidation system is a function of the catalyst temperature and associated catalyst activity. By maintaining the temperature at or above a minimum level, a predetermined control efficiency can be expected.

Some flexibility in defining the temperature(s) to be measured and monitored as the indicator of performance is appropriate for a regenerative catalytic unit. A regenerative catalytic unit will include more than one catalyst bed and the direction of flow though the beds will be changing as a normal part of operation. Because of the complexity of the system, establishing a minimum operating temperature based on a single measurement point within the combustion zone may be difficult or overly restrictive. The owner/operator may elect to monitor multiple temperatures to assure that a minimum temperature is maintained within the catalytic combustion zone, or may propose to monitor several temperatures and maintain a minimum average temperature.

Periodically assessing the catalyst activity will assure that the catalyst will function properly when the minimum bed temperature is maintained. Taking a sample of the catalyst and testing the catalyst conversion efficiency is one method of assessing the catalyst activity and is the approach presented in this protocol. The catalyst activity of the sample is evaluated and compared to typical values for fresh catalyst. The facility may propose to use other procedures for periodically assessing catalyst performance. For example, an alternative procedure might include an assessment of oxidizer VOC destruction efficiency using a flame ionization analyzer (FIA) or other VOC analyzer for three 20-minute runs may be proposed by the facility. This evaluation would not require submittal of a test protocol to the regulatory agency (or approval by the regulatory agency) or submittal of test reports and would not serve as an official performance test of the oxidizer destruction and removal efficiency (DRE). If the facility expects to use this type of assessment, it is recommended that the instruments and procedures to be used for the assessment are evaluated (i.e., used) concurrently with the initial performance test to establish a baseline. Another example of a basic approach to assess catalyst activity is to periodically monitor the temperature differential across the catalyst and maintaining a control chart of temperature differential versus VOC loading to the incinerator. A significant change in temperature differential for a particular VOC loading would indicate a potential change in catalyst activity warranting further investigation.

To further ensure consistent VOC oxidation, the structural integrity of the oxidizer should be checked periodically. This will indicate any problems with oxidizer integrity that could result in decreased oxidizer performance or efficiency.

For regenerative units, the chamber sequencing valves will be checked periodically to be sure that they are properly positioned during each heat recovery heating and cooling cycle. This will avoid the leakage of VOC to the oxidizer stack if the valves are not functioning properly. The design and operation of the chamber sequencing valves timing system will be documented during the performance test and verified during periodic inspections. This will identify changes in operation that might impact control efficiency.

An emissions performance test on the oxidizer is conducted once every 5 years to demonstrate compliance with permit conditions (i.e., percent destruction efficiency).

IV. Rationale for Selection of Indicator Ranges

The selected indicator range for the catalyst inlet bed control temperature is established based upon demonstrated performance during a performance test.

The minimum required operating temperature of the catalyst bed is established at the operating temperature maintained during a performance test. The catalytic oxidation system includes a temperature controller that maintains the desired catalyst bed temperature by using an auxiliary burner. The temperature controller is set to maintain a temperature at or above the established indicator range. As noted in Section II above, some flexibility in defining the temperature(s) to be measured and monitored as the indicator of performance is appropriate for a regenerative catalytic unit. Because of the complexity of the regenerative system, establishing a minimum operating temperature based on a single measurement point within the combustion zone may be difficult or overly restrictive. The owner/operator may elect to monitor multiple temperatures to assure that a minimum temperature is maintained within the catalytic combustion zone, or may propose to monitor several temperatures and maintain a minimum average temperature.

TABLE 2. (CONTINUED)

TABLE 2. MONITORING APPROACH FOR CATALYTIC OXIDIZER

	Indicator #1	Indicator #2	Indicator #3	Indicator #4
I. Indicator	Catalyst bed (Inlet) temperature.[a]	Work practice/inspection.	Performance test	Catalyst activity assessment.
Measurement Approach	Continuously record the operating temperature of the oxidizer catalyst bed.	Inspect internal and external structural integrity of oxidizer to ensure proper operation.[b,c]	Conduct emissions test to demonstrate compliance with permitted destruction efficiency.	Determine the catalyst activity level by evaluating the conversion efficiency.
II. Indicator Range	An excursion is identified as a measurement of 50°F less than the average temperature demonstrated during the most recent compliance demonstration, or as any 3-hour period when the average temperature is 50°F less than the average temperature demonstrated during the most recent compliance demonstration.	An excursion is identified as any finding that the structural integrity of the oxidizer has been jeopardized and it no longer operates as designed.	An excursion is identified as any finding that the oxidizer does not meet the permitted destruction efficiency.	The conversion efficiency is compared to the typical values for fresh catalyst. An excursion is identified as a finding that the conversion efficiency is beyond the operational range of the catalyst as defined by the manufacturer.
Corrective Action	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.	Each excursion triggers an inspection, correction action and a reporting requirement.
III. Performance Criteria A. Data Representativeness	Any temperature-monitoring device employed to measure the oxidizer chamber temperature shall be accurate to within 0.5% of temperature measured or ±5°F, whichever is greater.	Inspections of the oxidizer system will identify problems.	A test protocol shall be prepared and approved by the regulatory Agency prior to conducting the performance test.	Analysis will determine the conversion efficiency of the catalyst.
B. Verification of Operational Status	Temperatures recorded on chart paper or electronic media.	Inspection records.	Not applicable.	Not applicable.

TABLE 2. (CONTINUED)

	Indicator #1	Indicator #2	Indicator #3	Indicator #4
C. QA/QC Practices and Criteria	Validation of temperature system conducted annually. Acceptance criteria ± 20~~F~~°F.[a]	Not applicable.	EPA test methods approved in protocol.	Not applicable.
D. Monitoring Frequency	Measured continuously	• External inspection – monthly. • Internal inspection – annually.[b, c, d]	Once every 5 years.	Annually.
Data Collection Procedure	Recorded at least every 15-minutes on a chart or electronic media.	Record results of inspections and observations.	Per approved test method.	Record results of catalyst sample analyses.
Averaging Period	Not applicable if using any measured value as indicator; Three hours if using 3-hour average as indicator.	Not applicable.	Not applicable.	Not applicable.
E. Record Keeping	Maintain for a period of 5 years records of chart recorder paper or electronic media and corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and corrective actions taken in response to excursions.	Maintain a copy of the test report for 5 years or until another test is conducted. Maintain records of corrective actions taken in response to excursions.	Maintain for a period of 5 years records of catalyst analyses and corrective actions taken in response to excursions.
F. Reporting	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.	Submit test protocol and notification of testing to Agency 30 days prior to test date. Submit test report 60 days after conducting a performance test.	Number, duration, cause of any excursion and the corrective action taken.
Frequency	Semiannually.	Semiannually.	For each performance test conducted.	Semiannually.

[a] Facility to maintain Standard Operating Procedure on-site for verifying accuracy of system.

[b] Internal inspection of regenerative units should include annual assessment of valves for leakage; this assessment may be comprised of an internal inspection, or other method of assessing for leakage.

[c] Internal inspection of recuperative units should include annual assessment of heat exchanger for leakage (this assessment may be comprised of an internal inspection, or other method of assessing for leakage.)

[d] Evaluation of catalytic oxidizer's VOC destruction efficiency using a flame ionization analyzer (FIA) for three 20-minute runs, will serve in lieu of an internal inspection. This evaluation does not require submittal of a test protocol to the regulatory agency (or approval by the regulatory agency) or submittal of test reports.

PROTOCOL 3
Solvent Recovery Systems
Inlet and Outlet Mass Flow Rate

I. Applicability

This monitoring protocol is applicable to solvent recovery systems controlling VOC and organic HAP emissions from presses, coating operations and laminating operations in the printing and publishing and flexible packaging industries.

This monitoring protocol addresses monitoring of the control device operation, only, and does not address required monitoring of emissions capture systems associated with the individual process units. (See associated protocols for capture systems.)

II. Monitoring Approach

A continuous emissions monitoring system measures the concentration of VOC at the inlet and outlet of the adsorber and air flow rate at one of the locations (inlet or outlet) to determine the removal efficiency of the adsorber on a real time basis.

The elements of the monitoring approach, including indicators to be monitored, indicator ranges, and performance criteria, are presented in Table 3.

III. Rationale for Selection of Performance Indicators

Solvent concentration in the adsorber inlet and exhaust air stream is the true indication of the systems adsorption activity and, therefore, removal efficiency. As a batch process, the adsorber loading increases over time to saturation. Furthermore, in conditions of low inlet concentrations, the adsorber outlet concentration will be a larger proportion of the inlet concentration (i.e., lower percent removal efficiency. Therefore, removal efficiency is never constant and must be averaged over time. If volumetric flow rate from the process to the adsorber varies significantly, determining an average removal efficiency using only the average inlet and outlet concentration will be biased. Such conditions require the use of the mass flow rate of VOC to determine the average removal efficiency. This requires measuring the inlet and outlet VOC concentrations, as well as the air flow rate at the inlet or outlet of the system to calculate solvent removal efficiency. If the flow rate to the control device does not vary significantly, continuously monitoring the air flow rate may not be necessary and the control efficiency may be determined based on concentrations, alone. Sources desiring to monitor inlet and outlet concentrations, alone, should provide information (historical data or engineering analyses) to support the lack of a need to monitor flow rate through the system. However, 40 CFR 63, Subpart KK requires monitoring the flow rate to determine efficiency on a mass basis (when using the alternative continuous emissions monitoring systems (CEMS) approach for solvent recovery units); consequently sources subject to Subpart KK must monitor flow rate.

IV. Rationale for Selection of Indicator Ranges

Using this protocol the monitoring data are used to calculate an actual control device efficiency. The calculated control device efficiency is used to determine compliance. An indicator range is not selected. However, outlet solvent concentration as compared to the inlet concentration provides an indication of the adsorber efficiency. As saturation of the adsorber is reached, a breakthrough condition will occur, signaling the need to switch to a regenerated adsorber. Outlet concentration will range from very low, to concentrations approaching the inlet concentration at the point of breakthrough. As a practical matter, to properly operate the control device, the facility is likely to select an outlet concentration that will initiate bed switching and regeneration. However, this value need not be considered an indicator range for purposes of reporting excursions.

TABLE 3. MONITORING APPROACH FOR SOLVENT RECOVERY SYSTEMS

	Indicator #1	Indicator #2
I. Indicator	Percent removal efficiency	Work practice
Measurement Approach	A CEMS is used to measure the VOC concentration at the inlet and outlet, and the air flow rate at either the inlet or outlet of the adsorber system.	Inspect structural, mechanical and electrical integrity of the system.
II. Indicator Range	An excursion is defined as a measured average (mass) recovery efficiency for the month less than regulatory requirements.	An excursion is identified as any finding that the integrity of the system has been jeopardized and it no longer operates as designed.
Corrective Action	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.	Each excursion triggers an assessment of the problem, corrective action and a reporting requirement.
III. Performance Criteria A. Data Representativeness	Any monitoring device employed to measure the solvent concentration in air stream at accuracy of, +/- 3% of full scale.	Inspections will adequately identify problems.
B. Verification of Operational Status	Concentrations and air flow rate recorded on paper or electronic media.	Inspection records.
C. QA/QC Practices and Criteria	Validation of instrument accuracy conducted quarterly. Daily calibration drift checks.	Not applicable.
D. Monitoring Frequency	Measurement of inlet and outlet concentration and inlet or outlet air flow rate once every 15 minutes.	• Internal adsorber inspection – annually. • External system inspection – monthly.
Data Collection Procedure	Record on paper or electronic media.	Record results of inspections and observations.
Averaging Period	1 month (period may differ depending upon applicable requirement).	Not applicable.
E. Record Keeping	Maintain for a period of 5 years paper or electronic media and corrective actions taken in response to excursions.	Maintain for a period of 5 years records of inspections and corrective actions taken in response to excursions.
F. Reporting	Number, duration, cause of any excursion and the corrective action taken.	Number, duration, cause of any excursion and the corrective action taken.
Frequency	Semiannually.	Semiannually

PROTOCOL 4
Solvent Recovery Systems
Liquid-Liquid Material Balance

I. Applicability

This monitoring protocol is applicable to solvent recovery systems controlling VOC and organic HAP emissions from presses, coating operations and laminating operations in the printing and publishing and flexible packaging industries.

This monitoring approach (protocol) addresses monitoring of the overall capture and control system. Because this approach addresses the combined capture and control efficiency, additional monitoring of the control device or capture systems associated with individual process units is not required.

However, additional monitoring of the control device (e.g., operating parameters) may be required if specific monitoring is required under an applicable requirement, PSD provision, or SIP requirement, and the additional monitoring is not (or cannot be) subsumed via streamlining.

II. Monitoring Approach

The solvent recovered is quantified and a liquid-liquid material balance is conducted.

III. Rationale for Selection of Performance Indicators

Use of the liquid-liquid material balance is an accepted compliance determination method for determining VOC and HAP emissions from solvent recovery systems.

IV. Rationale for Selection of Indicator Ranges

Not applicable

V. Procedures

Perform a liquid-liquid material balance for each month. Follow the liquid-liquid material balance procedures of 40 CFR 63, subpart KK, section 63.824(b)(1)(i) or 63.825 (c)(1).

Note: The material balance can include consideration of the amount of HAP and VOC recovered in waste streams provided the volume of waste and VOC and HAP content in the waste is determined by appropriate methods.

VI. QA/QC

Provide a plan that briefly describes the general method to be used for calibrating the mass and/or volume measuring devices required for the LLMB measurements, and the frequency of calibration (e.g., annually).

APPENDIX E
EXAMPLE QA/QC PLAN FOR A SOURCE THAT MONITORS MATERIAL USAGE

This Appendix presents one example of a QA/QC plan that addresses monitoring material usage. Specifically, the example concerns a wide-web flexographic press affected source using compliant coating options to comply with 40 CFR part 63, subpart KK. However, this approach may be appropriate for other situations that involve tracking materials.

Because § 63.825 of subpart KK specifies the procedures for determining material composition and the equations used to determine compliance status for each month, these procedures and equations are not addressed further in the material below. Nevertheless, we recommend these procedures and equations be incorporated into the permit and included in the QA/QC plan called for by 40 CFR § 63.8(d).

Subpart KK does not specify how the mass of materials used each month is to be determined. By leaving the method of mass measurement up to the discretion of the facility, the facility has the freedom to use any reasonable procedure, subject to your approval, as long as compliance with the standard can be determined reliably each month. However, in the absence of rule-specified measurement methods, we recommend the facility specify the mass monitoring procedures in its quality control plan.

We recommend that a complete description be provided for each mass measurement system used at the facility, along with the type(s) of materials for which the system is used. For example, different measurement systems might be used for inks, coatings, solvents, etc. Similarly, different systems might be used for materials dispensed from totes, bulk storage tanks, etc.

Note that we expect the description of each mass measurement system to be based on procedures that the facility is already using (or intends to use). Except for the instances where QA/QC procedures have not been developed, we believe that generally no new procedures should be needed. Each measurement system should identify how the facility ensures the accuracy of the initial and ongoing measurements.

I. CONTENT OF THE QA/QC PLAN

We believe the content of a QA/QC plan is important, and the elements of a plan for monitoring material usage you may find useful are discussed in paragraphs A through E below. Paragraph F contains an example QA/QC plan for your consideration.

A. Mass Measurement Approach

<u>Subpart KK has been structured to allow for simple inventory measurement approaches, and we expect that these approaches will be used most frequently</u>. Subpart KK has also been structured to give sources the flexibility to use instrumental and manual approaches that can collect more project specific data over a shorter time period. We discuss these measurement approaches primarily to assist facilities that must address other, short-term applicable requirements (e.g., daily, line-by-line VOC compliance) that involve similar approaches to measuring data. Such facilities may wish to demonstrate compliance with subpart KK using these measurement approaches since they are already in place for purposes of these other applicable requirements. By

including this material, we do <u>not</u> intend to suggest that frequent, short-term measurements are required or are superior for purposes of implementing subpart KK.

1. <u>Inventory</u> (such as tracking usage through drums in storage and deliveries). May be used alone or in combination with instrumental or manual methods.

    a. <u>Approach used</u>. Describe what is tracked and how the inventory system is used to determine usage over the appropriate period, e.g., the usage determination is based on the unopened drums in storage at the beginning of the month, plus the drums delivered, minus the unopened drums in storage at the end of the month.

    b. <u>Location</u>. Describe where the materials are inventoried (e.g., storage areas) or which department maintains the purchase or delivery records used to determine compliance.

2. <u>Instrumental</u> (such as scales and totalizing volumetric flow meters)

    a. <u>Type of instrument</u>. Identify what is measured and the measurement principle, e.g., totalizing volumetric flow meter measuring cumulative volume using positive displacement. For flexibility, the facility can list more than one type of instrument, provided all are acceptable for the purpose.

    b. <u>Specifications</u>. Identify the minimum accuracy and precision to be achieved by the instrument, with the range within which the specifications are to be achieved, e.g., scale accurate to within ±1% with precision of ±0.5% between 0 lb and 1000 lb). Note that the accuracy and precision to be specified only when suppliers of the instrument typically provide these values.

    c. <u>Measurement span</u>. Identify the minimum and maximum values that can be measured with the instrument, e.g., scale with span from 0 to 800 lb.

    d. <u>Scaling</u>. Identify the smallest units that can be read from the instrument, e.g., totalizing volumetric flow meter with a digital readout to 0.1 gallon.

    e. <u>Location in the process</u>. Identify where in the process the measurement is taken, e.g., a scale is used to determine the mass of each tote before the tote is taken to the press and when the tote is returned from the press.

3. <u>Manual</u> (such as "sticking" drums and measuring out solvent with a pitcher)

    a. <u>Approach used</u>. Identify what is measured and how it is measured, e.g., the depth of material remaining in 55-gallon drum is measured by inserting a measuring stick into the drum.

    b. <u>Location in the process</u>. Identify where in the process the measurement is taken, e.g., thinning solvent is measured out as it is added to each ink/coating.

B. Measurement Frequency

Specify when each measurement is to be performed. Depending on the measurement system, this may be at the beginning and end of each month, at the beginning and end of each job, or each time solvent is added to an ink or coating, etc.

Note that the compliance options in 40 CFR § 63.825(b)(2) and (3) require tracking of the as-applied composition of each "solids-containing material" (e.g., ink or coating). This means that solvent (or other material) usage should be tracked for each of the specific solids-containing material to which it is added. A facility that wishes to maintain these options should describe how measurements will be performed to allow the as-applied composition of each solids-containing material to be calculated for each month.

C. Calculations

Show how collected data are transformed via calculations to determine compliance status. The monitoring plan should include the equations provided in subpart KK and each equation used to determine the material usage values that are inserted into subpart KK's equations. Include sample calculations for initial data entry and monthly usage.

D. Recordkeeping

Consistent with subpart KK and the applicable MACT General Provisions on recordkeeping, the facility must maintain records of the data collected and the procedures used to determine compliance with the standard. Thus, for monthly material usage, the facility must record each measurement and should document the equations used to determine usage and the results. These records must be retained for 5 years as specified in the MACT General Provisions and title V [see 40 CFR §§ 63.10(b) and 70.6(a)(2)].

In addition to the recordkeeping requirements above, the facility may choose to have the plan identify the following items:

1. Responsible Individual. Specify who is responsible for making and recording each measurement. This identification may be by job title, such as "press operator" or "mix room operator."

2. Data Entry Procedures. Specify when each measurement is to be entered. For example, the readings on a bank of solvent volumetric flow meters may be entered into a log on the first operating day of the month, or the amount of solvent added to a mixing vessel may be entered into a computer at the time the batch is mixed. Each data entry should be initialed by the individual making the entry and accompanied by the date and (if pertinent to compliance) the time of the entry.

3. Data Aggregation Procedures. If applicable, specify any additional steps where data are transferred or aggregated prior to performing calculations. For example, if the material tracking system uses a label affixed to each ink drum in storage on which the current weight of the contents is maintained, the plan might specify that these data are transferred to a log book during the final shift on the last operating day of each month in preparation for a materials inventory at the end of each month. As with initial data entry, any transferred data should be accompanied by the date of the transfer and the initials of the individual making the transfer.

4. Calculations. Specify who is responsible for making and recording each calculation. Again, this identification may be by job title. Indicate when calculations and results are to be recorded. As above, calculations and results should be accompanied by the date performed and the initials of the individual doing the calculations.

E. Quality Assurance/Quality Control Procedures

Each measurement system should have associated QA/QC activities to ensure that the data continue to meet compliance demonstration needs. This section presents the elements that should be addressed in the plan.

Foremost, the QA/QC procedures should make sense for the particular usage measurement systems in use. These procedures may be more extensive and detailed for instrumental systems, and where many short-term measurements are made. In contrast, a less extensive procedure may be appropriate for a facility that uses a long-term inventory approach that coincides with the materials tracking that the facility conducts for business purposes.

Quality assurance and quality control are concepts that were developed primarily for instrumental measurement systems. Consequently, the elements presented below are, in many cases, applicable primarily to such systems. Many QA/QC procedures will not need to address all the elements presented below. See the example plan in Section F below for an example of QA/QC procedures for the long term inventory approaches expected to be used typically for subpart KK compliance demonstrations.

1. Initial Installation and Calibration Procedures. The plan should specify these procedures for instruments and associated automated recording systems. These procedures are expected to be provided by instrument suppliers.

2. Preventive Maintenance Procedures. The plan should detail regularly-scheduled preventive maintenance procedures for instruments and automated recording and information storage system. Preventive maintenance for records maintained on a computer may include periodic back-up procedures. The preventive maintenance procedures may also include a list of parts kept in inventory.

The plan should also anticipate routine or otherwise predictable instrument failures. The plan should include procedures for corrective action and a list of parts kept in inventory for this purpose.

3. Frequent QC Checks. The plan should include periodic checks to ensure that the measurement approach is functioning properly. At a minimum, verify that instruments are operating and giving reasonable numbers. Make additional checks as appropriate, e.g., verify the calibration of a scale using a Class F weight; verify the calibration of liquid flow meters. The plan should specify what constitutes unacceptable performance and how to identify the beginning and end of any invalid data periods.

   You and the facility should come to an agreement on the frequency of these checks. For instruments, the initial frequency should be based on the vendor's recommendations. The plan should provide for increasing the frequency if problems are discovered. The plan may also allow for the frequency to be decreased if experience shows that less frequent checks are justified.

4. Periodic Data Accuracy Assessments. The plan should designate the frequency of these assessments (e.g., semi-annually, annually) and specify what constitutes unacceptable performance. In addition, the plan should specify how to identify the beginning and end of any invalid data periods.

   a. Periodic accuracy audits. The plan should specify procedures for recalibration and determination of calibration error of instruments and automated recording systems, as appropriate. In addition, the plan should provide for assessments of manual measurement devices and replacement, if necessary (markings wearing off, etc.). If an audit determines that the instrument is outside the acceptable range, then shorten the period between accuracy audits.

   b. Independent verification of usage data. Where short-term measurements (e.g., per job) are made and summed for the month, check against long-term inventory records, or vice versa. These comparisons should not be expected to result in exact agreement. However, failure to agree within reasonable expectations can be a signal of a short-coming in the tracking system. In accordance with subpart KK reporting requirements, we would expect the facility to conduct this verification semi-annually.

   c. Periodic reviews. The plan should provide for a periodic review of measurement and recordkeeping procedures to verify that they are being properly followed. During this process, the facility should provide you with an opportunity for on-site evaluation of the usage measurement systems and QA/QC procedures.

d. Periodic calculation checks. The plan should provide for periodic verification that the calculations are performed correctly, whether carried out manually or by computer.

5. Data Validity. The plan should specify the requirements for usage data to be considered valid. These requirements typically will be based on the parameters that are evaluated for the frequent and periodic checks in III.E.3 and 4 above. Consequently, data validity is primarily applicable to instrumental measurement approaches.

   As mentioned in section 4.3.2, the source may request, and you may allow, a back-up mechanism to be used in the event of primary monitoring system malfunction or failure. If such a back-up mechanism exists, we recommend it be included in the plan.

6. Data Availability. The facility must provide a compliance determination (by one of the compliance options) for every month. Failure to provide a determination would be a violation of the rule and the permit.

   The plan should specify minimum data availability requirements for each measurement needed for the compliance determination.

7. Recordkeeping. The plan should specify recordkeeping procedures to document that the QA/QC program has been carried out properly. The facility should retain records of the results of QA/QC activities (e.g., checklists and forms on which to record routine actions and outcomes) as required for other compliance activity records.

8. Miscellaneous. The following miscellaneous materials should be included in the plan:

   a. QA/QC responsibilities (which departments, groups, or individuals are responsible for each aspect of the plan).

   b. Schedules for frequent checks, periodic audits/reviews, and PM activities.

   c. Checklists, data sheets, preventive maintenance procedures specified by instrument manufacturers, and the spare parts inventory.

   d. Description of medium, format, and location of all records and of the reports that the facility submits to you.

9. Annual Review. At least annually, review the monitoring program, results, and the plan. Revise the plan, if necessary.

F. Example Plan

The following plan serves as an example for a facility with a wide margin of compliance, e.g., a facility with HAP emissions well below the subpart KK limits, and that uses a very simple inventory system as its compliance method. As mentioned earlier, the margin of compliance is a significant factor in selecting the measurement approach. A large margin of compliance allows a facility to use a less comprehensive measurement approach and less rigorous QA/QC, while a narrow margin requires a more comprehensive measurement approach and tighter, or more rigorous, QA/QC. In any event, the measurement approach should be accurate enough for each month's compliance status to be clearly known.

In this example, a facility named WWFCo operates wide-web flexographic presses and, like many other similar facilities, has a very wide margin of compliance, since it uses hundreds of thousands of pounds of materials with little or no HAP content each month, but only hundreds of pounds (or less) of materials with HAP contents above the subpart KK limits.

A facility such as WWFCo can demonstrate compliance easily using the options in 40 CFR § 63.825(b)(4) or (5) (monthly average as-applied organic HAP content) and a very simple inventory system based on purchase records alone. Generally, this kind of measurement system is applicable to facilities whose regulated emissions are at a level of 50 percent or less of the standard. However, the appropriateness of the measurement system depends on the facility's particular ratio of compliant to noncompliant materials, HAP content of each type of material, and pattern and size of deliveries.

Note that this kind of measurement system may also be appropriate for facilities tracking a rolling 12-month total VOC emissions cap established as part of the permitting process, particularly after 12 months of data have been accumulated. Again, the suitability depends on the particular situation at a facility.

a. Measurement approach. WWFCo operates several wide-web flexographic presses and is subject to 40 CFR part 63, subpart KK. WWFCo has chosen to demonstrate compliance with subpart KK for each month using the procedures of 40 CFR § 63.825(b)(4) or (5).

HAP content (C_{hi} and C_{hj}) and solids content (C_{si}) of materials applied: WWFCo will use the values from the most recent certified product data sheet (CPDS) obtained from each material's supplier. Information from these data sheets are kept on file in WWFCo's offices.

Quantity of materials applied for the month (M_i and M_j): WWFCo has chosen to calculate the quantity of each material used for the month by summing the amount of the material purchased during the month, based on purchase records. The purchase records are maintained in the facility's Purchasing Department (PD) computing system. All purchases are transacted in terms of pounds delivered.

This method implicitly assumes that all purchased materials are applied during the month, and that no other materials (i.e., materials on hand at the beginning of the month) are applied.

b. Measurement frequency.

Material composition: WWFCo's suppliers provide a CPDS each time it purchases a new product or the supplier changes the formulation of the material. New CPDSs replace any outdated versions immediately upon receipt.

Material usage: Each purchase record is a "measurement." Purchase records are entered into the WWFCo system within 5 working days after the delivery.

c. Calculations.

Material composition: None. Values supplied on CPDSs.

Material usage: For each material, all purchases during the month are summed to approximate total usage for the month. Purchases are all conducted in terms of pounds of material, so no conversions are required. For example, if three shipments of Material A are received during a month, the calculation might look like:

$$\begin{aligned} Material\ A &= Shipment\ 1 + Shipment\ 2 + Shipment\ 3 \\ &= 2{,}410\ lb + 2{,}116\ lb + 1{,}966\ lb \\ &= 6{,}492\ lb \end{aligned}$$

Monthly compliance: WWFCo has chosen to use Equation 6 or 7 from subpart KK.

d. Recordkeeping. WWFCo will maintain hard copies of each current CPDS in its files. New and replacement CPDS are transmitted to WWFCo by the supplier upon delivery and routed to a WWFCo environmental engineer. The engineer enters each pertinent CPDS value into the WWFCo material compliance spreadsheet prior to performing the compliance calculations at the end of the month. The CPDSs are filed by the WWFCo clerical staff after being entered into the compliance spreadsheet.

Purchase records are created at the time of material delivery. These records typically are entered into the PD computer within 5 working days after the delivery.

After the last day of each month, WWFCo performs the compliance calculation using both Equations 6 and 7 from subpart KK and verifies that the results demonstrate compliance for the month. Records of each monthly calculation are kept on file.

For semi-annual reports, a spreadsheet macro extracts the data for each month and prepares appropriate tables. A WWFCo environmental engineer prepares the appropriate text for the report, and a responsible official signs and submits the report. The reports are maintained as electronic computer files and in hard copy.

e. QA/QC procedures. All computer data and records are backed up every Friday evening.

Every 6 months, WWFCo will review purchase records (i.e., the records uploaded into the compliance spreadsheet) against summary records received from the material suppliers. If these records fail to agree within 10 percent, WWFCo will evaluate the probable sources of error and, if necessary, revise the plan to correct any shortcomings.

Every year, WWFCo will perform a comprehensive review of the QA/QC program, including spot-checking the material composition values in the spreadsheet against CPDS hard copies and reviewing spreadsheet macros and equations to verify that they are correct. For any errors that are identified, the past year's compliance calculations will be redone, and the results reported to the permitting authority. The corrected calculations will replace the erroneous ones. If any errors are identified, the plan will be revised to minimize their recurrence.

Records of all QA/QC activities, audits, and reviews will be maintained in the files.