

U. S. ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 63

[AD-FRL-]

NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS;
PROPOSED STANDARDS FOR HAZARDOUS AIR POLLUTANTS FROM
CHEMICAL RECOVERY COMBUSTION SOURCES AT KRAFT, SODA,
SULFITE, AND STAND-ALONE SEMICHEMICAL PULP MILLS

AGENCY: Environmental Protection Agency (EPA)

ACTION: Proposed Rule and Notice of Public Hearing

SUMMARY: This action proposes national emission standards for hazardous air pollutants (NESHAP) for the pulp and paper production source category under section 112 of the Clean Air Act as amended (CAA). The proposed standards focus on reducing hazardous air pollutants (HAP's) from new and existing sources used in chemical recovery processes at kraft, soda, sulfite, and stand-alone semichemical pulp mills. The intent of the proposed standards is to protect the public health and the environment by reducing HAP emissions to the level corresponding to the maximum achievable control technology (MACT). The proposed standards would reduce HAP emissions by about 2,600 megagrams per year (Mg/yr) (2,800 tons per year [tons/yr]). In addition, emissions of criteria pollutants such as particulate matter (PM) and volatile organic compounds (VOC's) would be reduced by about 56,400 Mg/yr (62,100 tons/yr).

DATES: Comments. The EPA will accept written comments on the proposed rule until [insert 60 days after publication in the FEDERAL REGISTER].

Public Hearing. If requested, EPA will hold a public hearing concerning the proposed rule beginning at 10 a.m. on [contact Ms. Cathy Coats at (919) 541-5422 for date to be inserted in the FEDERAL REGISTER notice] at the EPA Office of Administration Auditorium, Research Triangle Park, North Carolina. Requests to present oral testimony must be made by [insert date 3 weeks after publication in the FEDERAL REGISTER].

ADDRESSES: Requests to Speak at Hearing. Requests to present oral testimony at the public hearing should be submitted to Ms. Cathy Coats, Minerals and Inorganic Chemicals Group (MD-13), Emission Standards Division, U. S. Environmental Protection Agency, Research Triangle Park, NC 27711, telephone number (919) 541-5422. Persons interested in attending the hearing should call Ms. Coats to verify that a hearing will be held.

Comments. Interested parties may submit written comments (in duplicate, if possible) to Public Docket No. A-94-67 at the following address: U. S. Environmental Protection Agency, Air and Radiation Docket and Information Center, 401 M Street, SW., Washington, D.C. 20460. The EPA requests that a separate copy of the comments also be sent

to the contact person listed below in the "FOR FURTHER INFORMATION CONTACT" section.

Comments may also be submitted electronically by sending electronic mail (e-mail) to: a-and-r-docket@epamail.epa.gov. Electronic comments must be submitted as an ASCII file avoiding the use of special characters and any form of encryption. Comments will also be accepted on diskette in WordPerfect 5.1 or ASCII file format. All comments in electronic form must be identified by the docket number (No. A-94-67). No confidential business information should be submitted through e-mail. Electronic comments may be filed online at many Federal Depository Libraries.

FOR FURTHER INFORMATION CONTACT: Mr. Jeff Telander, Minerals and Inorganic Chemicals Group, Emissions Standards Division (MD-13), U. S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541-5427.

SUPPLEMENTARY INFORMATION: Regulated entities. Entities potentially regulated by this proposed rule are those kraft, soda, sulfite, and stand-alone semichemical pulp mills with chemical recovery processes that involve the combustion of spent pulping liquor. Regulated categories and entities are listed below in Table 1.

TABLE 1. REGULATED CATEGORIES AND ENTITIES

Category	Examples of regulated entities
Industry	kraft pulp mills soda pulp mills sulfite pulp mills stand-alone semichemical pulp mills

Table 1 is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. Table 1 lists the types of entities that EPA is now aware could potentially be regulated by this action. Other types of entities not listed in the table could also be regulated. To determine whether your facility is regulated by this action, you should carefully examine the applicability criteria in § 63.860. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding "FOR FURTHER INFORMATION CONTACT" section.

Electronically available information. The preamble and the regulatory text for this proposed NESHAP for chemical recovery combustion sources at kraft, soda, sulfite, and stand-alone semichemical pulp mills are available on the Technology Transfer Network (TTN), one of EPA's electronic

bulletin boards. The TTN provides a forum for technological and regulatory exchange in various areas of air pollution control. The service is free, except for the cost of a phone call. Dial (919) 541-5742 for up to a 14,400 baud rate modem. If more information on the TTN is needed, call the TTN help line at (919) 541-5384.

Docket. The docket (No. A-94-67) is available for public inspection and copying from 8:30 a.m. to noon and from 1 to 3 p.m., Monday through Friday at EPA's Air and Radiation Docket and Information Center, Waterside Mall, Room M-1500 (ground floor), 401 M Street, SW., Washington, D.C. 20460.

The following documents and other supporting materials related to this rulemaking are available for review in the docket center: Technical Support Document: Chemical Recovery Combustion Sources at Kraft and Soda Pulp Mills (docket entry No. II-A-31); Technical Support Document: Chemical Recovery Combustion Sources at Sulfite Pulp Mills (docket entry No. II-A-28); Profile of U.S. Stand-Alone Semichemical Pulp Mills Memo (docket entry No. II-B-70); Nationwide Baseline HAP Emissions for Combustion Sources at Stand-Alone Semichemical Pulp Mills Memo (docket entry No. II-B-67); Nationwide Costs, Environmental Impacts and Cost-Effectiveness of HAP Control Options for Combustion Sources at Stand-Alone Semichemical Mills Memo (docket entry No.

II-B-69); the Nationwide Costs, Environmental Impacts, and Cost-Effectiveness of Regulatory Alternatives for Kraft, Soda, Sulfite, and Semichemical Combustion Sources Memo (docket entry No. II-B-63); the Economic Analysis for the National Emission Standards for Hazardous Air Pollutants for Source Category: Pulp and Paper Production; Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards: Pulp, Paper, and Paperboard Category--Phase I (docket entry No. II-A-32); the State of Washington PM Data for Kraft Recovery Furnaces, Smelt Dissolving Tanks, and Lime Kilns Memo (docket entry No. II-B-59); and the State of Washington PM Data for Sulfite Combustion Units Memo (docket entry No. II-B-40). Also, copies of this information may be obtained from the Air Docket upon request by calling (202) 260-7548 or sending a FAX to (202) 260-4000. A reasonable fee may be charged for copies of docket materials.

The information presented in the remainder of this preamble is organized as follows:

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I. Statutory Authority

The statutory authority for this proposal is provided by sections 101, 112, 114, 116, and 301 of the Clean Air Act, as amended (42 U.S.C. 7401, 7412, 7414, 7416, and 7601).

II. Introduction

A. Background

On February 23, 1978, EPA promulgated new source performance standards (NSPS) to limit emissions of PM and total reduced sulfur (TRS) compounds from new, modified, and reconstructed kraft pulp mills under authority of section 111 of the Act (43 FR 7568). In addition, EPA issued retrofit guidelines in 1979 for control of TRS emissions at existing kraft pulp mills not subject to the NSPS. The NSPS for kraft pulp mills limit TRS emissions from recovery furnaces, smelt dissolving tanks (SDT's), lime kilns, digesters, multiple effect evaporators, black liquor oxidation (BLO) systems, brownstock washers, and condensate strippers that were constructed, modified, or reconstructed after September 24, 1976. The standards also limit PM emissions from recovery furnaces, SDT's, and lime kilns that were constructed, modified, or reconstructed after September 24, 1976. As required under section 111(a) of the

Act, these standards reflected the application of the best technological system of continuous emission reduction that the Administrator determined had been adequately demonstrated (taking into consideration the cost of achieving such emission reduction, and any nonair quality health and environmental impacts and energy requirements).

Revisions to these standards were promulgated on May 20, 1986 (51 FR 18538). The revisions exempted BLO systems from the TRS standards; revised the existing TRS limit and format of the standard for SDT's; deleted the requirement to monitor the combustion temperature in lime kilns, power boilers, and recovery furnaces; changed the frequency of excess emission reports from quarterly to semiannually; and exempted diffusion washers from the TRS standard for brownstock washers. The revisions also required that monitored emissions be recorded and specified the conditions [§ 60.284(e)] under which excess emissions would not be deemed a violation of § 60.11(d). Today's action does not revise or change the TRS requirements of the NSPS. However, today's standards do include PM emission limits, as a surrogate for measuring PM HAP emissions, for combustion sources (existing and new) in the chemical recovery area of the mill.

On December 17, 1993, EPA proposed (1) effluent limitations guidelines and standards for the control of

wastewater pollutants for the pulp and paper industry and (2) NESHAP for noncombustion sources in the pulp and paper industry (58 FR 66078), otherwise referred to as "MACT I." The emission points covered in the proposed NESHAP for noncombustion sources were limited to process units in the pulping and bleaching processes (e.g., digesters, bleaching towers, and associated tanks) and in the associated wastewater collection and treatment systems at mills that chemically pulp wood fiber using kraft, sulfite, soda, or semichemical methods. In March 1996, EPA proposed to include for regulation additional noncombustion operations and mills not covered under the December 17, 1993 proposal (e.g., mechanical pulping, pulping of secondary fiber by nonchemical means, nonwood pulping, and paper machines), otherwise referred to as "MACT III" (61 FR 9383). The NESHAP for noncombustion sources and the effluent guidelines are being promulgated as part of today's integrated rule, "NESHAP for Source Category: Pulp and Paper Production; Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards: Pulp, Paper, and Paperboard Category." This proposed NESHAP for chemical recovery combustion sources at kraft, soda, sulfite and stand-alone semichemical pulp mills, otherwise referred to as "MACT II," does not revise or change the requirements of

the NESHAP for noncombustion sources that is being promulgated today.

B. NESHAP for Source Categories

Section 112 of the Act provides a list of 189 HAP's and directs EPA to develop rules to control HAP emissions from both new and existing major sources. The Act requires that the rules be established by categories of emission sources considering all HAP's emitted, rather than establishing rules based on the emission of a single pollutant from a source category. The statute also requires that the standards reflect the maximum degree of reduction in emissions of HAP's that is achievable, taking into consideration the cost of achieving such emission reduction and any nonair quality health and environmental impacts and energy requirements. This level of control is commonly referred to as MACT.

In addition, the Act sets out specific criteria to be considered for establishing a minimum level of control and criteria (incremental cost, energy impacts, etc.) for evaluating control options more stringent than the minimum level of control. This minimum level of control is commonly referred to as the MACT "floor." The MACT floor for new sources, as specified by the Act, is "the emission control that is achieved in practice by the best controlled similar source." The MACT floor for existing sources, as specified

by the Act, is the average emission limitation achieved by the best performing 12 percent of existing sources in each category or subcategory of 30 or more sources (CAA section 112(d)(3)). For smaller categories or subcategories, the Act specifies that standards shall not be less stringent than the average emission limitation achieved by the best performing five sources in the category or subcategory. These floor determinations are based on data available to the Administrator at the time the standards are developed. The statutory provisions do not limit how the standard is set, beyond requiring that it be applicable to all sources in a category or subcategory and at least as stringent as the MACT floor. The emission standards are to be reviewed and revised as necessary no less often than every 8 years. Also, EPA may later promulgate more stringent standards to address any unacceptable health or environmental risk that remains after the imposition of controls resulting from today's standards (CAA section 112(f)).

C. Health Effects of Pollutants

The Clean Air Act was created in part "to protect and enhance the quality of the nation's air resources so as to promote the public health and welfare and the productive capacity of its population" (CAA section 101(b)(1)).

Title III of the Act establishes a technology-based control

program to reduce stationary source emissions of HAP's. The goal of section 112(d) is to apply such control technology to reduce emissions and thereby reduce the hazard of HAP's emitted from stationary sources.

This proposed rule is technology-based (i.e., based on MACT). The MACT strategy avoids dependence on a risk-based approach as a pre-requisite for regulating air toxics. Such risk assessments are limited by incomplete information on what HAP's are emitted, what level of emissions is occurring, what health and safety benchmarks are available to assess risk, what health effects may be caused by certain pollutants, and how best to model these effects, among other things. Because of these issues, a quantitative risk assessment of potential effects from all of the HAP's emitted from pulp and paper combustion sources is not included in this rulemaking. However, as described in section IV.D.3.d of this preamble, an exposure assessment was conducted to determine if current emissions of hydrogen chloride (HCl) from pulp and paper combustion sources result in exposures that provide an ample margin of safety.

The EPA does recognize that the degree of adverse effects to health can range from mild to severe. The extent and degree to which health effects may be experienced is dependent upon (1) ambient concentrations observed in the area, (2) duration of exposures, and (3) characteristics of

exposed individuals (e.g., genetics, age, pre-existing health conditions, and lifestyle) which vary significantly with the population. Some of these factors are also influenced by source-specific characteristics (e.g., emission rates and local meteorological conditions) as well as pollutant-specific characteristics.

Available emission data, collected during development of this proposed rule, show that metals, various organic compounds, and HCl are the most significant HAP's emitted from pulp and paper combustion sources. Following is a summary of the potential health and environmental effects associated with exposures, at some level, to these emitted pollutants.

Almost all metals appearing on the section 112(b) list are emitted from pulp and paper combustion sources. These metals can cause a range of effects, including mucous membrane effects (e.g., bronchitis, decreased lung function), gastrointestinal effects, nervous system disorders (from cognitive effects to coma or even death), skin irritation, and reproductive and developmental disorders. Additionally, several of the metals accumulate in the environment and in the human body. Cadmium, for example, is a cumulative pollutant that can cause kidney effects after cessation of exposure. Similarly, the onset of effects from beryllium exposure may be delayed by months

to years. Further, some of the metal compounds have been classified by EPA as known (e.g., arsenic and chromium (VI)) or probable (e.g., cadmium and beryllium) human carcinogens.

All forms of mercury, a volatile metal, may be characterized as quite toxic, with different health effects associated with different forms of the pollutant. Methyl mercury is the most toxic form of mercury to which humans and wildlife generally are exposed. Exposure to methyl mercury occurs primarily through the aquatic food chain. The target organ for methyl mercury toxicity in humans is the nervous system. The range of neurotoxic effects can vary from subtle decrements in motor skills and sensory ability to tremors, inability to walk, convulsions, and death. Exposure to inorganic mercury is associated with renal impairment. Some forms of mercury have also been classified as possible human carcinogens. Exposure to mercury compounds can also cause effects in plants, birds, and nonhuman mammals. Reproductive effects are the primary concern for avian mercury poisoning.

Organic compounds emitted from pulp and paper combustion sources include acetaldehyde, benzene, formaldehyde, methyl ethyl ketone, methyl isobutyl ketone, methanol, phenol, styrene, toluene, and xylenes. These organic compounds have a range of potential health effects associated with exposure at some level. Some of the effects

associated with short-term inhalation exposure to these pollutants are similar and include irritation of the eyes, skin, and respiratory tract in humans; central nervous system effects (e.g., drowsiness, dizziness, headaches, depression, nausea, irregular heartbeat); reproductive and developmental effects; and neurological effects. Exposure to benzene and methyl isobutyl ketone at extremely high concentrations may lead to respiratory paralysis, coma, or death. Human health effects associated with long-term inhalation exposure to the organic compounds listed above may include mild symptoms such as nausea, headache, weakness, insomnia, intestinal pain, and burning eyes; effects on the central nervous system; disorders of the blood; toxicity to the immune system; reproductive disorders in women (e.g., increased risk of spontaneous abortion); developmental effects; gastrointestinal irritation; liver injury; and muscular effects.

In addition to the noncancer effects described above, some of the organic HAP's emitted from pulp and paper combustion sources have been classified by EPA as either known (e.g., benzene) or probable (e.g., acetaldehyde and formaldehyde) human carcinogens.

Hydrogen chloride is an inorganic HAP which is highly corrosive to the eyes, skin, and mucous membranes. Short-term inhalation of HCl by humans may cause coughing,

hoarseness, inflammation and ulceration of the respiratory tract, as well as chest pain and pulmonary edema if exposure exceeds threshold concentrations. Long-term occupational exposure of humans to HCl has been reported to cause inflammation of the stomach, skin, and lungs, and photosensitization.

The health and environmental effects associated with exposure to PM and ozone are described in EPA's Criteria Documents, which support the national ambient air quality standards (EPA 1996, "Air Quality Criteria for Ozone and Related Photochemical Oxidants," EPA-600/P-93-004, RTP, NC; EPA 1996, "Air Quality Criteria for Particulate Matter," EPA-600/P-95-001, RTP, NC). Briefly, PM emissions have been associated with aggravation of existing respiratory and cardiovascular disease and increased risk of premature death. Volatile organic compounds are precursors to the formation of ozone in the ambient air. At ambient levels, human laboratory and community studies have shown that ozone is responsible for the reduction of lung function, respiratory symptoms (e.g., cough, chest pain, throat and nose irritation), increased hospital admissions for respiratory causes, and increased lung inflammation. Animal studies have shown increased susceptibility to respiratory infection and lung structure changes.

Studies have shown that exposure to ozone can cause foliar injury and disrupt carbohydrate production and distribution in plants. The reduction in carbohydrate production and allocation can lead to reduced root growth, reduced biomass or yield production, reduced plant vigor (which can increase susceptibility to attack from insects and disease and damage from cold), and diminished ability to successfully compete with more tolerant species. These effects have been observed in native vegetation in natural ecosystems and in a selected number of commercial trees and agricultural crops.

D. Industry Profile

There are currently 122 kraft, 2 soda, 15 sulfite, and 14 stand-alone semichemical pulp mills in the United States. The majority (52 percent) of kraft mills are located in the Southeastern United States. The two soda pulp mills are located in Tennessee and Pennsylvania. The majority of sulfite mills (67 percent) are located in Washington and Wisconsin. Half of all stand-alone semichemical pulp mills are located in the Midwestern United States.

The kraft process is the dominant pulping process in the United States. The kraft and soda processes account for approximately 82 percent of all domestic pulp production; sulfite and stand-alone semichemical processes account for

approximately 2 and 6 percent of the domestic pulp production, respectively.

Numerous HAP compounds are emitted from combustion sources in the chemical recovery area at kraft, soda, sulfite, and stand-alone semichemical pulp mills. The HAP compounds emitted in the largest quantities are methanol and HCl. Methanol and HCl account for approximately 70 percent of the total HAP's emitted from the chemical recovery area.

All of the kraft, soda, sulfite, and stand-alone semichemical pulp mills are believed to be major HAP emission sources (i.e., emissions greater than or equal to 9.1 Mg/yr [10 tons/yr] for an individual HAP or 23 Mg/yr [25 tons/yr] for total HAP's). In most cases, HAP emissions from combustion sources in the chemical recovery area alone are sufficient to characterize these mills as major sources.

III. Summary of Proposed Standards

A. Applicability

The proposed standards apply to all existing and new kraft, soda, sulfite, and stand-alone semichemical pulp mills with chemical recovery processes that involve the combustion of spent pulping liquor. Specifically, the sources that are regulated by today's proposed standards are (1) nondirect contact evaporator (NDCE) recovery furnaces, direct contact evaporator (DCE) recovery furnace systems, SDT's, and lime kilns at kraft and soda pulp mills;

- (2) sulfite combustion units at sulfite pulp mills; and
- (3) semichemical combustion units at stand-alone semichemical pulp mills.

All existing kraft and soda pulp mills have chemical recovery processes that involve the combustion of spent pulping liquor. However, several existing sulfite and stand-alone semichemical pulp mills do not recover pulping chemicals by combusting spent liquor. Three of the 15 sulfite mills use a calcium-based sulfite process and do not have chemical recovery combustion units and, thus, would not be impacted by this proposed rule. One of the 14 stand-alone semichemical pulp mills burns spent liquor in a power boiler and does not have chemical recovery; therefore, that mill also would not be impacted by this proposed rule.

B. Emission Limits and Requirements

Today's proposed standards would regulate PM HAP emissions and/or total gaseous organic HAP emissions for chemical recovery combustion sources in the pulp and paper source category. The proposed emission standards are summarized in Table 2.

TABLE 2. SUMMARY OF PROPOSED EMISSION STANDARDS^a

Subcategory	Emission point	PM HAP standard		Alternate PM HAP standard ("bubble")		Total gaseous organic HAP standard					
		Existing	New	Existing	New	Existing	New				
Kraft and soda	Recovery furnaces (NDCE and DCE)	PM \leq 0.10 gr/dscm (0.044 gr/dscf) at 8% O ₂ OR PM HAP \leq 1.00E-03 kg/Mg (2.01E-03 lb/ton) BLS	PM \leq 0.034 g/dscm (0.015 gr/dscf) at 8% O ₂	Mill-specific PM or PM HAP emission limit (kg/Mg (lb/ton) BLS) based on calculated value of the sum of the individual emission limits for recovery furnaces, smelt dissolving tanks, and lime kilns. See equations 1 and 2 in section III.B.1.	No "bubble" alternate standard for new sources	No standard	Total gaseous organic HAP \leq 0.012 kg/Mg (0.025 lb/ton) BLS (as measured by methanol)				
								PM \leq 0.10 kg/Mg (0.20 lb/ton) BLS OR PM HAP \leq 6.20E-05 kg/Mg (1.24E-04 lb/ton) BLS	PM \leq 0.06 kg/Mg (0.12 lb/ton) BLS	No standard ^b	No standard ^b
Sulfite combustion units	PM \leq 0.092 g/dscm (0.040 gr/dscf) at 8% O ₂	PM \leq 0.046 g/dscm (0.020 gr/dscf) at 8% O ₂	Not applicable	Not applicable	No standard ^b	No standard ^b					
							Stand-alone semi-chemical	No standard	No standard	Not applicable	Not applicable

^aBLS = black liquor solids; CaO = calcium oxide (lime); THC = total hydrocarbons; gr/dscf = grains per dry standard cubic foot; g/dscm = grams per dry standard cubic meter; kg/Mg = kilograms per megagram; lb/ton = pounds per ton; O₂ = oxygen.

^bEmissions of total gaseous organic HAP's from these sources are regulated as part of the NESHAP for noncombustion sources at pulp and paper mills.

Hazardous air pollutants are proposed only for existing recovery furnaces, SDT's, and lime kilns at kraft and soda pulp mills. Limits for total gaseous organic HAP emissions are proposed for new kraft and soda recovery furnaces and existing and new semichemical combustion units. Either methanol or total hydrocarbons (THC), depending on the subcategory, is used as a surrogate for total gaseous organic HAP emissions. The emission standards for each subcategory are discussed in the following sections by the pollutant regulated.

1. PM HAP Standards for Kraft and Soda Pulp Mills

Today's rule proposes PM HAP emission limits for existing recovery furnaces, SDT's, and lime kilns at kraft and soda pulp mills. In addition, PM emission limits are proposed as a surrogate for PM HAP emission limits for both new and existing affected sources at kraft and soda pulp mills. The EPA is using the term "PM HAP" in this preamble to refer to the standards which can be measured either on a total PM basis or on a HAP component of PM basis. For existing kraft and soda recovery furnaces, SDT's, and gas-fired lime kilns, the proposed PM emission limits are the same as the New Source Performance Standards for Kraft Pulp Mills (43 FR 7568). Under today's proposed standards, existing oil-fired lime kilns would be subject to a more stringent PM standard than the NSPS requirements.

The proposed standards also would allow the use of a "bubble compliance alternative" for determining compliance with the PM HAP standard for existing sources at kraft and soda pulp mills. The bubble compliance alternative would allow mills to set PM or PM HAP emission limits for each existing affected source at the mill such that, if these limits are met, the total emissions from all existing affected sources would be less than or equal to a mill-specific bubble limit. This mill-specific bubble limit is calculated based on the proposed emission limits (referred to as reference concentrations or reference emission rates) for each affected source and mill-specific gas flow rates and process rates. Equation 1, below, would be used to calculate the bubble limit based on PM emissions.

$$EL_{PM} = [(C_{ref,RF})(Q_{RFtot}) + (C_{ref,LK})(Q_{LKtot})](F1) / (BLS_{tot}) + ER1_{ref,SDT}$$

Eq. (1)

where:

EL_{PM} = overall PM emission limit for all existing affected sources at the kraft or soda pulp mill, kg/Mg (lb/ton) of black liquor solids fired.

$C_{ref,RF}$ = reference concentration of 0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen for existing kraft or soda recovery furnaces.

Q_{RFtot} = sum of the average gas flow rates measured during the performance test from all existing recovery furnaces at the kraft or soda pulp mill, dry standard cubic meters per minute (dscm/min) (dry standard cubic feet per minute [dscf/min]).

$C_{ref,LK}$ = reference concentration of 0.15 g/dscm (0.067 gr/dscf) corrected to 10 percent oxygen for existing kraft or soda lime kilns.

Q_{LKtot} = sum of the average gas flow rates measured during the performance test from all existing lime kilns at the kraft or soda pulp mill, dscm/min (dscf/min).

F1 = conversion factor, 1.44 minutes • kilogram/day • gram (min • kg/d • g) (0.206 minutes • pound/day • grain [min • lb/d • gr]).

BLS_{tot} = sum of the average black liquor solids firing rates of all existing recovery furnaces at the kraft or soda pulp mill measured during the performance test, megagrams per day (Mg/d) (tons per day [tons/d]) of black liquor solids fired.

$ER1_{ref,SDT}$ = reference emission rate of 0.10 kg/Mg (0.20 lb/ton) of black liquor solids fired for existing kraft or soda smelt dissolving tanks.

Equation 2, below, would be used to calculate the total bubble limit based on PM HAP emissions.

$$EL_{PMHAP} = ER_{ref,RF} + (ER_{ref,LK})(CaO_{tot}/BLS_{tot}) + ER2_{ref,SDT} \quad \text{Eq. (2)}$$

where:

EL_{PMHAP} = overall PM HAP emission limit for all existing affected sources at the kraft or soda pulp mill, kg/Mg (lb/ton) of black liquor solids fired.

$ER_{ref,RF}$ = reference emission rate of 1.00E-03 kg/Mg (2.01E-03 lb/ton) of black liquor solids fired for existing kraft or soda recovery furnaces.

$ER_{ref,LK}$ = reference emission rate of 6.33E-03 kg/Mg (1.27E-02 lb/ton) of CaO produced for existing kraft or soda lime kilns.

CaO_{tot} = sum of the average lime production rates for all existing lime kilns at the kraft or soda pulp mill measured as CaO during

the performance test, Mg CaO/d (ton CaO/d).

BLS_{tot} = sum of average black liquor solids firing rates of all existing recovery furnaces at the kraft or soda pulp mill measured during the performance test, Mg/d (ton/d) of black liquor solids fired.

$ER2_{ref,SDT}$ = reference emission rate of $6.20E-05$ kg/Mg ($1.24E-04$ lb/ton) of black liquor solids fired for existing kraft or soda smelt dissolving tanks.

Owners or operators that choose to comply with the PM HAP standards using the proposed bubble compliance alternative would be allowed to meet either the PM bubble limit determined in Equation 1 or the PM HAP bubble limit determined in Equation 2, but would not be required to meet both bubble limits. The proposed bubble compliance alternative would not be applicable to new sources. All new affected sources at kraft and soda pulp mills would be required to meet the individual emission limitations set for those sources. Also, owners or operators of existing sources subject to the NSPS for kraft pulp mills would be required to continue to meet the PM emission limits of that rule, regardless of which option they choose for complying with today's PM HAP standard.

Owners or operators that choose to comply with the PM HAP standards using the proposed bubble compliance alternative would be required to submit preliminary emission limits to the applicable permitting authority for approval for each existing kraft or soda recovery furnace, SDT, and lime kiln at the mill. Before the preliminary PM or PM HAP emission limits would be approved, the owner or operator would be required to submit documentation demonstrating that if the preliminary emission limits for each emission source are met, the entire group of affected sources would be in compliance with the mill-wide allowable emission level. The allowable emission level would be determined from the applicable bubble equation using the reference concentrations and reference emission rates for each emission source and source-specific factors for exhaust gas flow rates and process rates. Once approved by the applicable permitting authority, the emission limits would be incorporated in the operating permit for the mill. Thereafter, the owner or operator of the kraft or soda pulp mill would demonstrate compliance with the standards by demonstrating that each recovery furnace, SDT, and lime kiln emitted less than or equal to the approved emission limit for that source. In addition, the PM emission limits for any existing recovery furnace, SDT, and lime kiln subject to the NSPS for kraft pulp mills must be at least as stringent

as the PM emission limits established in the NSPS. An example of how the bubble compliance alternative can be used to establish emission limits for affected sources at an example mill is provided in the docket (docket entry No. II-B-75).

With one exception, owners or operators that choose to comply with the PM HAP standards using the proposed bubble compliance alternative must include all existing sources in the bubble. Any existing affected source that can be classified as a stand-by unit (i.e., a source that operates for less than 6,300 hours during any calendar year) could not be included as part of a bubble. Owners or operators of stand-by units must accept either the proposed PM or proposed PM HAP emission limits shown in Table 2 for those units. The EPA requests comments on the proposal to exclude stand-by units from the proposed bubble compliance alternative. Some have argued that stand-by units--especially units operating less than 20 percent of the year--may be relatively expensive to control. Thus, inclusion of stand-by units within a compliance bubble may yield important cost savings by allowing a more stringent control of other units to offset the relatively high cost emissions from the stand-by unit. The EPA also requests comment on the proposed definition of a stand-by unit as a unit operating less than 6,300 hours in a calendar year.

2. Total Gaseous Organic HAP Standards for Kraft and Soda Pulp Mills

There are no standards under the proposed rule for total gaseous organic HAP's for existing NDCE recovery furnaces or DCE recovery furnace systems. All new recovery furnaces at kraft and soda pulp mills would be required to meet a total gaseous organic HAP limit, as measured by methanol, of 0.012 kg/Mg (0.025 lb/ton) of black liquor solids fired.

3. PM Standards for Sulfite Pulp Mills

Existing sulfite combustion units would be required to meet a PM emission limit of 0.092 g/dscm (0.040 gr/dscf) corrected to 8 percent oxygen. New sulfite combustion units would be required to meet a PM emission limit of 0.046 g/dscm (0.020 gr/dscf) corrected to 8 percent oxygen.

4. Total Gaseous Organic HAP Standards for Stand-Alone Semicheical Pulp Mills

All existing and new stand-alone semicheical pulp mills with chemical recovery combustion units would be required to reduce total gaseous organic HAP emissions (measured as THC) from these units by 90 percent, or meet a total gaseous organic HAP emission limit (measured as THC) of 1.49 kg/Mg (2.97 lb/ton) of black liquor solids fired.

C. Performance Test Requirements

The following discussion identifies the test methods to be used for compliance determinations.

Test Method 5, "Determination of Particulate Emissions from Stationary Sources" [40 CFR part 60, appendix A]--in conjunction with either the integrated sampling techniques of Test Method 3, "Gas Analysis for the Determination of Dry Molecular Weight" [40 CFR part 60, appendix A] or Test Method 3A, "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources" [40 CFR part 60, appendix A]--is the test method for determining compliance with the PM emission standards for new and existing kraft and soda recovery furnaces, SDT's, and lime kilns and for new and existing sulfite combustion units. Test Method 17, "Determination of Particulate Emissions from Stationary Sources (In-Stack Filtration Method)" may be used as an alternative to Test Method 5 if a constant value of 0.009 g/dscm (0.004 gr/dscf) is added to the results of Test Method 17 and the stack temperature is no greater than 205 degrees Centigrade (°C) [400 degrees Fahrenheit (°F)].

Test Method 29, "Determination of Metals Emissions from Stationary Sources" [40 CFR part 60, appendix A] is the test method for determining compliance with the PM HAP emission standards for existing kraft and soda recovery furnaces, SDT's, and lime kilns. Test Method 29 also may be used as

an alternative to Test Method 5 for measuring PM emissions. The Agency also will allow operators or owners the option of measuring all of the PM HAP's (except mercury) with Test Method 29 and making a separate measurement of the mercury using Test Method 101A, "Determination of Particulate and Gaseous Mercury Emissions from Sewage Sludge Incinerators" [40 CFR part 61, appendix A].

Test Method 308, "Procedure for Determination of Methanol Emissions from Stationary Sources" is being promulgated today as part of the final NESHAP for noncombustion sources at pulp and paper mills and is the test method for determining compliance with the total gaseous organic HAP emission limit for new kraft and soda NDCE recovery furnaces that are not equipped with dry electrostatic precipitator (ESP) systems and for DCE recovery furnace systems.

Test Method 25A, "Determination of Total Gaseous Organic Concentration using a Flame Ionization Analyzer" [40 CFR part 60, appendix A] is the test method for determining compliance with the total gaseous organic HAP emission limit for new and existing combustion sources at stand-alone semichemical pulp mills.

D. Monitoring Requirements and Compliance Provisions

Each owner or operator of an affected source would be required to install, operate, calibrate, and maintain a

continuous monitoring system for each affected source. The owner or operator also would be required to establish a range of values for each operating parameter (associated with a process operation or with an emission control device) to be monitored based upon values recorded during the initial performance test or during qualifying previous performance tests using the required test methods. If values from previous performance tests are used to establish the operating parameter range, the owner or operator would be required to certify that the control devices and processes had not been modified subsequent to the testing upon which the data used to establish the operating ranges were obtained. The owner or operator could conduct multiple performance tests to establish ranges of operating parameters. The owner or operator also could establish expanded or replacement ranges during subsequent performance tests. An exceedance of the operating parameters would occur when the measured operating parameter levels, averaged over a specified time period, are outside the established range for a predetermined duration. However, with the exception of opacity exceedances, no more than one exceedance would be attributed to an affected source during any given 24-hour period. The following paragraphs describe (1) the operating parameters to be monitored, (2) the averaging periods and frequency with which these parameters

should be monitored, (3) when corrective action is required to return operating parameters to levels that are within the established range, and (4) when operating parameter exceedances constitute a violation of the standards.

Owners or operators of existing kraft or soda recovery furnaces that are equipped with an ESP for PM or PM HAP control would be required to install, calibrate, maintain, and operate continuous opacity monitoring systems (COMS). The COMS would be required to perform at least one cycle of sampling and analysis for each successive 10-second period and one cycle of data recording for each successive 6-minute period. If 10 consecutive 6-minute average values of opacity exceed 20 percent, the owner or operator would be required to initiate the corrective actions contained in the mill's startup, shutdown, and malfunction (SSM) plan. A violation would occur when 6 percent of the 6-minute average opacity values recorded during any 6-month reporting period are greater than 35 percent.

Owners or operators of new kraft or soda recovery furnaces and new or existing kraft or soda lime kilns that are equipped with ESP's for PM or PM HAP control would also be required to install, calibrate, maintain, and operate COMS. The COMS would be required to perform at least one cycle of sampling and analysis for each successive 10-second period and one cycle of data recording for each successive

6-minute period. If 10 consecutive 6-minute average values of opacity are greater than 20 percent, the owner or operator would be required to initiate the corrective actions contained in the facility's SSM plan. A violation would occur when 6 percent of the 6-minute average opacity values within any 6-month reporting period are greater than 20 percent.

Owners or operators using wet scrubbers to meet the PM or PM HAP emission limits for any kraft or soda recovery furnace, smelt dissolving tank, or lime kiln or the PM limit for sulfite combustion units would be required to install, calibrate, maintain, and operate a continuous monitoring system capable of determining and permanently recording the pressure drop and scrubbing liquid flow rate at least once for each successive 15-minute period. If any 3-hour average of the pressure drop or scrubbing liquid flow rate falls outside the established range, the owner or operator would be required to initiate the corrective actions included in the facility's SSM plan. A violation would occur when six 3-hour average values of either parameter are outside the established range during any 6-month reporting period.

Owners or operators using regenerative thermal oxidizers (RTO's) to comply with the total gaseous organic HAP emission standard for chemical recovery combustion units at stand-alone semichemical mills would be required to

establish a minimum RTO operating temperature that indicates (1) at least a 90 percent reduction in HAP emissions (measured as THC) or (2) outlet HAP emissions (measured as THC) of less than or equal to 1.49 kg/Mg (2.97 lb/ton) of black liquor solids. To ensure ongoing compliance, the owner or operator would be required to install, calibrate, maintain, and operate a monitoring system to measure and record the RTO operating temperature for each successive 15-minute period. If any 1-hour average of the operating temperature falls below the minimum established temperature, the owner or operator would be required to initiate the corrective actions contained in the facility's SSM plan. A violation would occur when any 3-hour average of the RTO operating temperature falls below the minimum established temperature.

The owner or operator of an affected source that uses a wet scrubber, ESP, or RTO to comply with today's standards may monitor alternative operating parameters subject to prior written approval by the applicable permitting authority.

The owner or operator of an affected source that is complying with today's proposed standards through operational changes or by a control device other than those described above would be required to submit a plan proposing parameters to be monitored, parameter ranges, and monitoring

frequencies to be used to determine ongoing compliance, subject to approval by the applicable permitting authority. If any 3-hour average value of a monitored parameter falls outside the established range, the owner or operator would be required to initiate the corrective actions included in the facility's SSM plan. A violation would occur when six 3-hour average values of a monitored parameter are outside the established range during any 6-month reporting period.

Owners or operators complying with the total gaseous organic HAP standard for new kraft and soda recovery furnaces through the use of an NDCE recovery furnace equipped with a dry ESP system would not be required to perform any continuous parameter monitoring for gaseous organic HAP's; however, each owner or operator would be required to maintain onsite a certification statement signed by a responsible mill official that an NDCE recovery furnace equipped with a dry ESP system is in use.

E. Recordkeeping and Reporting Requirements

In addition to all of the recordkeeping and reporting requirements outlined in § 63.10 of the General Provisions (subpart A of 40 CFR part 63), owners or operators of kraft, soda, sulfite, and stand-alone semichemical pulp mills would be required to maintain the following records for each affected source: (1) records of the black liquor solids firing rates for all recovery furnaces at kraft and soda

pulp mills and spent liquor solids firing rates for all chemical recovery combustion units at sulfite and stand-alone semichemical pulp mills; (2) records of the lime production rates, calculated as CaO, for all kraft and soda lime kilns; (3) records of all parameter monitoring data; (4) records and documentation of supporting calculations for compliance determinations; (5) records of the established monitoring parameter ranges for each affected source; and (6) records of all certifications made in order to determine compliance with the total gaseous organic HAP standards. All records would have to be maintained for a minimum of 5 years.

IV. Rationale

This section describes the rationale for the decisions made by the Administrator in determining the proposed MACT floors for each source category and in selecting the proposed standards.

A. Selection of Source Category

The list of source categories was published in the Federal Register on July 16, 1992 and includes pulp and paper mills as major sources of HAP's (57 FR 31576). Standards for the pulp and paper production source category are being developed in phases. In December 1993, EPA proposed the first set of emission standards for the source category (i.e., a proposed NESHAP for noncombustion sources

in the pulp and paper industry, otherwise referred to as MACT I) as part of a "cluster rule" that also included proposed effluent guidelines and standards for the control of wastewater pollutants (58 FR 66078). In March 1996, EPA proposed to include for regulation additional noncombustion operations and mills not covered under the December 1993 proposal (i.e., MACT III) (61 FR 9383). The NESHAP for noncombustion sources, as well as the effluent guidelines and standards, are being promulgated as part of today's cluster rule. An additional set of standards for the source category is covered by today's proposed NESHAP for chemical recovery combustion sources (i.e., MACT II). Today's proposed "combustion sources" NESHAP covers (1) combustion units in the chemical recovery area at kraft, soda, sulfite, and stand-alone semichemical pulp mills, (2) SDT's at kraft and soda pulp mills, and (3) BLO systems at kraft pulp mills. Although kraft and soda SDT's and kraft BLO systems are not combustion sources, these equipment are included in today's proposed "combustion sources" NESHAP because they are closely associated with the chemical recovery combustion equipment. For the purposes of today's proposed standards, the combustion units, SDT's, and BLO systems are collectively referred to as "chemical recovery combustion sources." Specifically, the chemical recovery combustion sources are defined as (1) kraft and soda NDCE recovery

furnaces and DCE recovery furnace systems (which include BLO systems), (2) kraft and soda SDT's, (3) kraft and soda lime kilns, (4) sulfite combustion units, and (5) semichemical combustion units.

B. Selection of Emission Points

The following section identifies the HAP emission points for kraft, soda, sulfite and stand-alone semichemical pulp mills that were examined by the Agency for control under the proposed rule. General descriptions of the chemical recovery process and equipment also are included in this section. More detailed information on the emission points and chemical recovery process can be found in the technical support documents listed under the "ADDRESSES" section.

1. Emission Points--Kraft Pulp Mills

Emission points at kraft pulp mills that were examined by the Agency for control under the proposed standards are NDCE recovery furnaces and DCE recovery furnace systems, SDT's, and lime kilns. These emission points are integral parts of the kraft chemical recovery process, in which cooking liquor chemicals (i.e., sodium hydroxide [NaOH] and sodium sulfide [Na₂S]) are recovered from spent cooking liquor. Cooking liquor, which is used in the pulping process, is commonly referred to as white liquor; spent cooking liquor is commonly referred to as black liquor.

a. NDCE Recovery Furnaces and DCE Recovery Furnace Systems. There are an estimated 209 recovery furnaces operating at U.S. kraft pulp mills. The kraft recovery furnace is essentially a chemical recovery unit and steam generator that uses black liquor as its fuel. More specifically, the kraft recovery furnace (1) recovers inorganic pulping chemicals from black liquor as smelt by reducing sodium sulfate (Na_2SO_4) to Na_2S and (2) combusts organic compounds in black liquor to produce steam for mill processes.

Kraft recovery furnaces can be classified based on the type of final-stage evaporator used to increase the solids content of black liquor prior to firing in the furnace. The final-stage evaporator, which follows the multiple-effect evaporator (MEE), may be either an NDCE or DCE. Direct contact evaporators use flue gases from the recovery furnace to concentrate the black liquor. In the 1970's, as energy costs increased and Federal and State regulations were passed that limited TRS emissions from kraft pulp mills, the use of NDCE's (or concentrators) became more prevalent. By using an NDCE, the heat that was formerly used to concentrate black liquor in the DCE can be used to produce steam by extending the economizer section of the furnace, and the TRS emissions (associated with the DCE) will be decreased. For newer recovery furnaces, all of which use

NDCE's, the NDCE is often considered an integral part of the MEE. Approximately 61 percent of kraft recovery furnaces are NDCE recovery furnaces, and 39 percent are DCE recovery furnace systems. For the purposes of today's proposed rule, an "NDCE recovery furnace" is defined as a recovery furnace that is equipped with an NDCE that concentrates black liquor by indirect contact with steam. A "DCE recovery furnace system" is defined to include a DCE recovery furnace and any BLO system, if present, at the pulp mill; a "DCE recovery furnace" is defined as a recovery furnace that is equipped with a DCE that concentrates strong black liquor by direct contact between the hot recovery furnace exhaust gases and the strong black liquor.

All kraft recovery furnaces have a PM control device, typically an ESP. The PM collected in the ESP, which is predominantly Na_2SO_4 , is returned to the concentrated black liquor that is fired in the recovery furnace. The mechanism for returning the PM to the black liquor may be a dry system or may use either black liquor or process water.

In DCE recovery furnace systems, black liquor is oxidized prior to evaporation in the DCE. Black liquor oxidation reduces emissions of TRS compounds, which are stripped from black liquor in the DCE when the black liquor contacts hot flue gases from the recovery furnace. Black liquor can be oxidized using either air or pure (molecular)

oxygen. Air-sparging units operate by bubbling air through the black liquor using multiple diffuser nozzles. Air-sparging units have from one to three tanks (or stages) that operate in series and a corresponding number of emission points. At two mills, vent gases from air-sparging BLO units are routed to a power boiler to reduce TRS emissions via incineration. Molecular oxygen BLO systems resemble pipeline reactors and require relatively short residence times (i.e., 30 seconds to 5 minutes compared to 1 or more hours for air-sparging units). Because all of the oxygen is consumed in the reaction, no system vent is required with molecular oxygen BLO in-line reactors, and therefore, no emission point is associated with these systems. There are an estimated 46 BLO systems operating at kraft pulp mills. Mills with multiple DCE recovery furnaces have one BLO system. At present, only four mills (with seven DCE recovery furnaces) use a molecular oxygen BLO system.

The emission potential for DCE recovery furnace systems is higher than that for NDCE recovery furnaces because of the increased opportunity to strip HAP compounds from the black liquor in the process equipment. In the DCE recovery furnace system, gaseous organic HAP compounds can be stripped from the black liquor in the air-sparging BLO system and in the DCE. Similarly, the emission potential

for NDCE recovery furnaces with ESP's that use black liquor or HAP-contaminated process water in the ESP bottom or PM return system is higher than that for NDCE recovery furnaces that have dry ESP systems (i.e., dry-bottom ESP's and dry PM return systems). As with the air-sparging BLO systems and DCE's, stripping of gaseous organic HAP compounds can occur if black liquor or HAP-contaminated process water is used in the bottom of the ESP or in the PM return system.

In addition to the criteria pollutants (i.e., PM, NO_x, SO₂, CO, and VOC [ozone precursor]) and TRS, the compounds emitted in the largest quantities from NDCE recovery furnaces and DCE recovery furnace systems are methanol and HCl. For a given process emission rate, the total gaseous organic HAP emissions from DCE recovery furnace systems are, on average, approximately 14 times higher than NDCE recovery furnaces with dry ESP systems. Also, for a given process emission rate, the total gaseous organic HAP emissions from NDCE recovery furnaces with wet ESP systems (i.e., ESP's that use black liquor or HAP-contaminated process water in the ESP bottom or PM return system) are, on average, approximately 3.5 times higher than NDCE recovery furnaces with dry ESP systems. Of the total gaseous organic HAP's emitted, methanol emissions account for approximately 67 percent of emissions from DCE recovery furnace systems

and 13 percent of emissions from NDCE recovery furnaces with dry ESP systems.

For a given process emission rate, HCl emissions are approximately equivalent for both NDCE recovery furnaces and DCE recovery furnace systems. Hydrogen chloride emissions account for approximately 19 percent of the total gaseous HAP emissions from DCE recovery furnace systems and 76 percent of the total gaseous HAP emissions from NDCE recovery furnaces with dry ESP systems.

Particulate matter HAP's account for approximately 0.2 percent of the PM emissions and 0.3 percent of the total HAP emissions from recovery furnaces. Although the PM inlet loadings to the PM control devices for NDCE recovery furnaces are higher than for DCE recovery furnaces due to removal of 20 to 40 percent of the PM in the DCE unit, equivalent outlet PM emissions can be achieved with the use of add-on controls.

b. Smelt Dissolving Tanks. There are an estimated 227 SDT's at U.S. kraft pulp mills. This estimate is higher than the estimated number of recovery furnaces because some furnaces have two SDT's. The SDT is a large, covered vessel located below the recovery furnace and is the discharge point for molten smelt, which is the main product from the combustion of black liquor. Smelt, which is predominantly sodium carbonate (Na_2CO_3) and Na_2S , filters through the char

bed at the bottom of the recovery furnace and is continuously discharged through water-cooled spouts into the SDT. As the smelt exits the water-cooled spouts, the smelt stream is shattered with medium-pressure steam so that it can be safely dissolved in the SDT. In the SDT, smelt is dissolved in weak wash water from the recausticizing area to form unclarified green liquor, an aqueous solution of Na_2CO_3 and Na_2S .

Large volumes of steam are generated when the smelt is quenched in the SDT. Residual water vapor and PM generated during quenching are drawn off the tank through a venturi scrubber or other PM control device using an induced-draft fan. Particulate matter HAP's account for approximately 0.06 percent of the PM emissions from SDT's. The water used in the scrubber, which is typically weak wash, drains directly into the SDT. Gaseous organic HAP compounds (primarily methanol) also are emitted from SDT's as a result of the use of weak wash in the SDT and PM control device. Because of the elevated operating temperature of the SDT, gaseous organic HAP compounds present in the weak wash can volatilize and subsequently be released to the atmosphere.

c. Lime Kilns. An estimated 190 lime kilns operate at U.S. kraft pulp mills. The lime kiln is part of the recausticizing process in which green liquor from the SDT is converted to white liquor. Specifically, Na_2CO_3 in the

green liquor is converted to NaOH, a main constituent of white liquor, by adding reburned lime (CaO) from the lime kiln. The resulting white liquor solution contains NaOH, Na₂S, and calcium carbonate (Ca₂CO₃) precipitate (referred to as "lime mud"). Lime mud is removed from this solution in a white liquor clarifier. The lime mud is then washed, dewatered, and calcined in a lime kiln to produce reburned lime, which is recycled back to the green liquor.

Most kilns in use at kraft pulp mills are large rotary kilns (98 percent); a few fluidized-bed calciners are also used. Natural gas or fuel oil typically provides the energy for the calcining process. The majority of lime kilns at kraft pulp mills also burn noncondensable gas streams (NCG's) from various process vents, such as digester and evaporator vents.

Lime kiln exhaust gases consist of combustion products, carbon dioxide released during calcination, water vapor evaporated from the mud, and entrained lime dust. Particulate in the exhaust gases is mainly CaO, Ca₂CO₃, and sodium salts. Approximately 1.4 percent of the PM emissions from lime kilns is PM HAP's. Exhaust gases are routed through a PM control device prior to being discharged to the atmosphere. Venturi scrubbers and ESP's are the two most common types of PM control devices used to control PM emissions from lime kilns.

As with SDT's, gaseous organic HAP compounds (primarily methanol) also are emitted from lime kilns due primarily to the use of weak wash as the scrubbing liquor in the PM control device and lime mud washer. Because of the elevated gas stream temperature, gaseous organic HAP compounds present in the weak wash can volatilize and subsequently be released to the atmosphere.

2. Emission Points--Soda Pulp Mills

Emission points at soda pulp mills that were examined by the Agency for control under today's proposed standards are recovery furnaces, SDT's, and lime kilns. The processes and equipment used in the chemical recovery areas of soda and kraft pulp mills are similar, except that the soda process, because it is a nonsulfur process, does not require black liquor oxidation. With the exception of sulfur-containing compounds, the types and quantities of compounds emitted from soda pulp mills are comparable to the types and quantities of compounds emitted from kraft pulp mills. There are only two soda pulp mills in the United States, and no new soda mills are expected to be constructed. There are a total of two recovery furnaces (one NDCE and one DCE), two SDT's, and two lime kilns at the soda mills.

3. Emission Points--Sulfite Pulp Mills

The emission point at sulfite pulp mills that was examined by the Agency for control under the proposed

standard is the chemical recovery combustion unit. The chemical recovery combustion unit is an integral part of the chemical recovery process, which recovers cooking liquor chemicals from spent cooking liquor (also called red liquor). The types of chemical recovery combustion units used at sulfite mills are recovery furnaces, fluidized-bed reactors, and combustors. There are 18 recovery furnaces, 2 fluidized-bed reactors, and 1 combustor operating at sulfite pulp mills. For the purposes of today's proposed rule, these various combustion units are collectively referred to as "sulfite combustion units."

The process and equipment used to recover sulfite cooking liquor chemicals depend on the chemical base of the cooking liquor. Sulfite cooking liquors use one of four chemical bases--magnesium (Mg), ammonia (NH_3), calcium (Ca), or sodium (Na). Cooking liquor chemicals can be recovered for the Mg-, NH_3 -, and Na-based sulfite processes. Recovery of cooking liquor chemicals is not practical for the Ca-based sulfite process, and, therefore, no sulfite combustion units are used at the existing Ca-based sulfite mills. Additionally, there are currently no operating Na-based sulfite mills. There are currently six Mg-based sulfite mills and six NH_3 -based sulfite mills. Information on the sulfite combustion units at Mg- and NH_3 -based sulfite pulp mills follows.

At the six Mg-based sulfite mills, red liquor is fired in a recovery furnace or fluidized-bed reactor. There are nine recovery furnaces and two fluidized-bed reactors. Multiple-effect evaporators, which may be followed by a DCE or NDCE, are used to increase the solids content of the red liquor prior to firing in the combustion unit. Magnesium-based sulfite combustion units differ from kraft recovery furnaces in that there are no smelt beds. Combustion of the spent liquor produces both heat for steam generation and exhaust gases that contain magnesium oxide (MgO) particulate and SO₂ gas. When a recovery furnace is used, the major portion of the MgO is recovered as a fine white powder from the exhaust gases using multiple cyclones. When a fluidized-bed reactor is used, MgO from the exhaust gases is collected in a cyclone and from the bed of the reactor as pulverized bed material. The MgO from the recovery furnace or fluidized-bed reactor is then slaked with water to form magnesium hydroxide (Mg(OH)₂), which is used as circulating liquid in a series of absorption towers and/or venturi scrubbers designed to recover SO₂ from combustion gases. In the absorption towers/venturi scrubbers, SO₂ is recovered by reaction with Mg(OH)₂ to form a magnesium bisulfite solution. The magnesium bisulfite solution is then fortified with makeup SO₂ and subsequently used as cooking liquor. Some mills have installed air pollution control

devices, such as a fiber-bed demister system or an educted venturi scrubber, downstream of the SO₂ absorption equipment, to further reduce PM and/or SO₂ emissions.

At the six NH₃-based sulfite pulp mills, red liquor is fired in a recovery furnace or combustor. There are nine recovery furnaces and one combustor. The solids content of the red liquor is increased using MEE's, which may be followed by a DCE or NDCE. Combustion of the spent liquor produces both heat for steam generation and combustion gases that contain recoverable SO₂. The ammonia base is consumed during combustion, forming nitrogen and water. A small amount of ash is produced and periodically removed from the furnace bottom. (There are no smelt beds.) Sulfur dioxide is recovered from cooled flue gas in an acid-gas absorption tower to form an ammonium bisulfite solution. Fresh aqueous NH₃ is used as the circulating liquor in the absorption system. The ammonium bisulfite solution is fortified with makeup SO₂ and used as cooking liquor. Exit gases from the absorption system are typically routed to a fiber-bed demister system for PM removal and mist elimination prior to being discharged to the atmosphere. Some mills have installed a scrubber or mesh-pad mist eliminator upstream of the fiber-bed demister system for additional PM and SO₂ emission control and to improve the efficiency and operation of the fiber-bed demister system.

4. Emission Points--Stand-alone Semichemical Pulp Mills

The emission point at stand-alone semichemical pulp mills that was examined for control under today's proposed standards is the chemical recovery combustion unit. The combustion unit is used in the chemical recovery process to recover the inorganic cooking chemicals, produce steam, and remove the organic compounds in the black liquor by combustion. Cooking liquor chemicals are recovered as either smelt or ash, which is dissolved in water and mixed with make-up cooking chemicals to form white liquor.

There are 14 chemical recovery combustion units currently operating at stand-alone semichemical pulp mills. Five different types of chemical recovery combustion units are in operation: fluidized-bed reactors, recovery furnaces, smelters, rotary liquor kilns, and pyrolysis reactors. For the purposes of today's standards, these various combustion units are collectively referred to as "semichemical combustion units."

a. Fluidized-Bed Reactors. Seven fluidized-bed reactors are currently in use at seven stand-alone semichemical pulp mills. Fluidized-bed reactors are used extensively because the recovered chemicals are in the form of solid pellets, which can be stored in silos until the chemicals are needed to make fresh cooking liquor. This

practice requires less storage space than when recovered chemicals are routed directly to a dissolving tank and stored in solution.

In the fluidized-bed reactor, concentrated black liquor is fired from a single spray gun located at the top of the reactor. As the liquor falls towards the bed, evaporation and some combustion occurs, causing the liquor to pelletize. Fluidizing gas rises through the bed of solid pellets, setting the bed in fluid motion. The soda ash (Na_2CO_3) pellets are recovered from the reactor and stored in silos.

b. Recovery Furnaces. Two NDCE recovery furnaces are currently in use at two stand-alone semichemical pulp mills. Semichemical recovery furnaces, like kraft recovery furnaces, are used to recover cooking liquor chemicals by burning concentrated black liquor and to produce process steam with the heat of combustion. Semichemical and kraft recovery furnaces are similar in design.

c. Smelters. Two smelters are currently in use at a nonsulfur-based, stand-alone semichemical pulp mill. Smelters operate in a manner similar to recovery furnaces, except that smelters do not produce excess steam for mill processes and are actually net users of heat. The units currently in use are actually converted small kraft recovery furnaces.

d. Rotary Liquor Kilns. Two rotary liquor kilns are currently in use at two nonsulfur-based, stand-alone semichemical pulp mills. Unlike lime kilns used in the kraft chemical recovery process, rotary liquor kilns are used for the combustion of black liquor at semichemical pulp mills. In the kiln, fuel oil is burned in the lower end. An induced-draft fan at the upper end draws combustion air into the lower end and draws combustion gases through the kiln. Approximately halfway between the lower and upper ends, black liquor is fired into the kiln. Sodium carbonate ash created from contact between black liquor and combustion gases falls to the lower end of the kiln, then is routed to an ash dissolving tank. The combustion gases are routed to a waste heat boiler to produce steam.

e. Pyrolysis Reactor. One pyrolysis reactor is currently in use at a stand-alone semichemical pulp mill. "Pyrolysis" means chemical change caused by heat, not by combustion. In the pyrolysis reactor, fuel oil or propane is burned to provide the heat for pyrolysis. Black liquor is injected under high pressure in a finely atomized spray through several nozzles arranged around the wall of the pyrolysis chamber. The hot combustion gases travel downward at high velocity and contact the liquor sprays at high turbulence and rapid mixing. Pyrolysis reactions occur, converting the sodium in the liquor into a solid ash powder

composed mainly of soda ash (Na_2CO_3), and the other constituents into a gaseous mixture of hydrogen sulfide (H_2S) mixed with CO , carbon dioxide (CO_2), hydrogen (H_2), methane (CH_4), nitrogen (N_2), and water vapor.

f. HAP Emissions from Semicheical Combustion Sources.

Test data indicate that chemical recovery combustion units at stand-alone semichemical pulp mills are significant sources of gaseous organic HAP emissions. The major HAP compounds emitted from chemical recovery combustion units are methanol, benzene, methyl ethyl ketone, formaldehyde, and toluene. The fluidized-bed reactors emit the highest quantities of HAP's, while emissions from other semichemical combustion unit types (e.g., recovery furnaces and rotary liquor kilns) are much lower. For example, based on available HAP emissions data, the fluidized-bed reactors have total HAP emissions approximately 20 to 75 times higher per ton of black liquor solids fired than the other semichemical combustion unit types. Some of the other semichemical combustion unit types (e.g., recovery furnaces and rotary liquor kilns) are inherently lower-emitting because they achieve more complete combustion of organic compounds. (No HAP emission data were available for the pyrolysis unit; however, that unit is scheduled to be decommissioned by 1998 due to operational difficulties, and no more pyrolysis units are expected to be installed at

stand-alone semichemical pulp mills.) Unlike kraft recovery furnaces, most of the HAP's emitted from fluidized-bed reactors at stand-alone semichemical pulp mills are formed in the reactor due to incomplete combustion, not from contact of the exhaust stream with black liquor or HAP-contaminated water in the DCE or wet ESP systems. Carbon monoxide emissions, an indicator of combustion efficiency, have been measured from fluidized-bed reactors at levels as high as 50,000 parts per million by volume (ppm_v); by contrast, kraft recovery furnaces typically emit less than 1,000 ppm_v of CO. No add-on control devices are currently being used to control total gaseous organic HAP emissions from combustion sources at stand-alone semichemical pulp mills; however, at least one RTO will be installed to control emissions from a fluidized-bed reactor at a semichemical mill by the end of 1997.

C. Selection of Definition of Affected Source

Most industrial plants consist of numerous pieces or groups of equipment that emit HAP and that may be viewed as emission "sources." The Agency, therefore, uses the term "affected source" to designate the equipment within a particular kind of plant that is chosen as the "source" covered by a given standard. For today's rulemaking, EPA is proposing to define the affected source as each individual process unit within the chemical recovery area at kraft,

soda, sulfite, and stand-alone semichemical pulp mills. For kraft and soda pulp mills, each recovery furnace and its associated SDT('s) are considered together as an affected source. The Agency decided to consider these emission points as one source because recovery furnaces and SDT's are generally sold as one unit, although the emissions from the recovery furnace and the SDT are treated separately in nearly all cases. In today's proposed rulemaking, five process units are examined: (1) kraft and soda NDCE recovery furnaces (and associated SDT's), (2) kraft and soda DCE recovery furnace systems (and associated SDT's), (3) kraft and soda lime kilns, (4) sulfite combustion units, and (5) semichemical combustion units.

D. Selection of Pollutants

For purposes of this rule, the HAP's emitted from combustion sources at pulp mills have been divided into three categories: (1) PM HAP's, (2) total gaseous organic HAP's, and (3) HCl. The EPA proposes to regulate emissions of PM HAP's and gaseous organic HAP's.

1. PM HAP's

Available emission data indicate that PM HAP's are emitted from kraft and soda recovery furnaces, SDT's, and lime kilns and sulfite combustion units. Particulate matter HAP's represent approximately 0.2 percent of the PM emitted from these combustion sources. Particulate matter was

selected as a surrogate for HAP metals emitted in the form of particulate. Available data on PM control device performance indicate that control systems that control PM also control the HAP portion of the PM. (See Technical Support Document: Chemical Recovery Combustion Sources at Kraft and Soda Pulp Mills, Chapter 3; docket entry No. II-A-31.) However, as a means of maximizing compliance flexibility, the proposed rule also includes a PM HAP emission limit for existing affected sources at kraft and soda mills that choose to measure PM HAP's directly, as opposed to measuring PM.

2. Total Gaseous Organic HAP's

Available emission data indicate that the following gaseous organic HAP's are emitted from kraft and soda NDCE recovery furnaces and DCE recovery furnace systems and semichemical combustion units: acetaldehyde, benzene, formaldehyde, methyl ethyl ketone, methyl isobutyl ketone, methanol, phenol, styrene, toluene, and xylenes. Methanol is the predominant gaseous organic HAP emitted from kraft and soda NDCE recovery furnaces and DCE recovery furnace systems.

Methanol was selected as a surrogate for gaseous organic HAP compounds for demonstrating compliance with the total gaseous organic HAP limits for new kraft and soda NDCE recovery furnaces and DCE recovery furnace systems because

methanol is the predominant HAP emitted from these sources, and controls in place for methanol also would result in the control of other gaseous organic HAP compounds. (See Technical Support Document: Chemical Recovery Combustion Sources at Kraft and Soda Pulp Mills, Chapter 2; docket entry No. II-A-31.) For example, the major emission mechanism for the release of gaseous organic HAP compounds is the stripping of the compounds from the black liquor in the BLO unit, the DCE, and some ESP systems. Reducing contact between the gas streams and the black liquor in these units reduces not only methanol emissions but also emissions of other gaseous organic HAP's. In addition, performance tests are more expensive when a range of organic compounds must be measured. The measurement of methanol as a surrogate for gaseous organic HAP's reduces compliance costs. Therefore, the Agency selected methanol as a surrogate for total gaseous organic HAP emissions for new kraft and soda NDCE recovery furnaces and DCE recovery furnace systems.

For new and existing semichemical combustion units, THC emissions were selected as a surrogate for total gaseous organic HAP emissions. Emissions from semichemical combustion units are primarily the result of incomplete combustion, and THC emissions were found to correlate with

HAP emissions. (See Correlation of THC Emissions with HAP Emissions Memo; docket entry No. II-B-71.)

3. Hydrochloric Acid (HCl)

The Agency proposes not to regulate HCl emissions from recovery furnaces. Under the authority of section 112(d)(4), the Agency has determined that no further control is necessary because HCl is a "health threshold pollutant," and HCl levels emitted from recovery furnaces are below the threshold value within an ample margin of safety. The following discussion provides the basis for the Agency's decision not to regulate HCl emissions from recovery furnaces. Specifically, this section discusses (1) the statutory authority for considering the health threshold when establishing standards, (2) the determination of HCl as a threshold pollutant, (3) the exposure assessment modeling of HCl emissions from recovery furnaces, (4) an ecological assessment of HCl, and (5) the Agency's conclusions.

a. Statutory Authority. The Act includes certain exceptions to the general statutory requirement to establish emission standards based on the performance of MACT. Of relevance here, section 112(d)(4) provides EPA with authority, at its discretion, to develop risk-based standards for HAP's "for which a health threshold has been established", provided that the standard achieves an "ample margin of safety." (The full text of the section 112(d)(4):

"[w]ith respect to pollutants for which a health threshold has been established, the Administrator may consider such threshold level, within an ample margin of safety, when establishing emission standards under this subsection.")

The EPA presumptively applies section 112(d)(4) only to HAP's that are not carcinogens because Congress clearly intended that carcinogens be considered nonthreshold pollutants. (Staff of the Senate Committee on Environment and Public Works, A Legislative History of the Clean Air Act Amendments of 1990, Vol. 1 at 876, statement of Senator Durenberger during Senate Debate of October 27, 1990: "With respect to the pollutants for which a safe threshold can be set, the authority to set a standard less stringent than maximum achievable control technology is contained in subsection (d)(4). With respect to carcinogens and other non-threshold pollutants, no such authority exists in subsection (d) or in any other provision of the Act.") The legislative history further indicates that if EPA invokes this provision, it must assure that any emission standard results in ambient concentrations less than the health threshold, with an ample margin of safety, and that the standards must also be sufficient to protect against adverse environmental effects (S. Rep. No. 228, 101st Cong. at 171). Costs are not to be considered in establishing a standard pursuant to section 112(d)(4) (*Ibid.*).

Therefore, EPA believes it has the discretion under section 112(d)(4) to develop risk-based standards for some categories emitting threshold pollutants, which may be less stringent than the corresponding "floor"-based MACT standard would be. If EPA decided to develop standards under this provision, it would seek to assure that emissions from every source in the category or subcategory are less than the threshold level to an individual exposed at the upper end of the exposure distribution. The upper end of the exposure distribution is calculated using the "high end exposure estimate," defined as "a plausible estimate of individual exposure for those persons at the upper end of the exposure distribution, conceptually above the 90th percentile, but not higher than the individual in the population who has the highest exposure" (EPA Exposure Assessment Guidelines, 57 FR 22888, May 29, 1992). The EPA believes that assuring protection to persons at the upper end of the exposure distribution is consistent with the "ample margin of safety" requirement in section 112(d)(4).

The EPA emphasizes that use of section 112(d)(4) authority is wholly discretionary. As the legislative history described above indicates, cases may arise in which other considerations dictate that the Agency should not invoke this authority to establish less stringent standards, despite the existence of a health effects threshold that is

not jeopardized. For instance, EPA does not anticipate that it would set less stringent standards where evidence indicates a threat of significant or widespread environmental effects, although it may be shown that emissions from a particular source category do not approach or exceed a level requisite to protect public health with an ample margin of safety. The EPA may also elect not to set less stringent standards where the estimated health threshold for a contaminant is subject to large uncertainty. Thus, in considering appropriate uses of its discretionary authority under section 112(d)(4), EPA intends to consider other factors in addition to health thresholds, including uncertainty and potential "adverse environmental effects," as that phrase is defined in section 112(a)(7).

b. Health Effects Assessment. Several factors are considered in the Agency's decision of whether a pollutant should be categorized as a health threshold pollutant for the purposes of section 112(d)(4). These factors include evidence and classification of carcinogenic risk and evidence of noncarcinogenic effects. The following discussion focuses on these factors.

Consideration is given to any evidence of human carcinogenic risk associated with the pollutant. Based on Congress's intent, for the purposes of section 112(d)(4), the Administrator presumptively concludes that HAP's

classified as either Group A (known carcinogen), Group B (probable carcinogen), or Group C (possible carcinogen) (as defined under the EPA's 1986 Carcinogen Risk Assessment Guidelines (51 FR 33992; September 24, 1986)) should not be categorized as threshold pollutants (as per section 112(f)(2)(A) of the Act, which requires EPA to consider residual risk standards for pollutants classified as "known, probable, or possible human carcinogens"). The EPA recognizes that advances in risk assessment science and policy, as incorporated in future EPA risk assessment guidelines, may affect the way EPA differentiates between threshold and non-threshold HAP's. The EPA's draft Guidelines for Carcinogen Risk Assessment (public review draft, April, 1996) suggest that carcinogens be assigned non-linear dose-response relationships where data warrant. It is possible that dose-response curves for some substances may reach zero risk at a dose greater than zero, creating a threshold for carcinogenic effects. The EPA will consider both the state of the science and legislative intent in future rulemaking under section 112(d)(4). Under EPA's current guidelines, the Agency considers the data on carcinogenicity in humans and/or animals for pollutants with A, B, or C classifications adequate support for consideration of a HAP as a nonthreshold pollutant.

By definition, the Agency does not have enough evidence available to conclude whether HAP's with the weight of evidence classification of Group D (as defined under the EPA's 1986 Carcinogen Risk Assessment Guidelines [51 FR 33992; September 24, 1986]) pose a human cancer risk. Thus, the Agency will determine, on a case-by-case basis, whether the available evidence is sufficient to conclude whether a "safety threshold for exposure" exists for each HAP that is classified as a Group D pollutant. For the purposes of this action, the Agency believes it is reasonable to classify HCl as a Group D pollutant (see Health Assessment Document for Chlorine and Hydrogen Chloride, Review Draft; EPA-600/8-87/041A, August 1994). This classification is based on only one animal study, and no human data are available for review. In the animal study, no carcinogenic response was observed in rats exposed via inhalation. Based on the limited negative carcinogenicity data, and on EPA's knowledge of how HCl reacts in the body and its likely mechanism of action (discussed further below), the Agency presumptively considers HCl to be a threshold pollutant.

Under current EPA science policy, HAP's classified as Group E pollutants (evidence of noncarcinogenicity for humans) are presumptively considered by the Agency, for the purposes of section 112(d)(4), to have a "safety threshold of exposure." Therefore, Group E pollutants are considered

threshold pollutants, unless there is adequate evidence to the contrary. The EPA has developed new risk assessment guidelines for reproductive effects (see <http://www.epa.gov/ORD/WebPubs/repro>), and is in the process of developing others (e.g., developmental effects and neurotoxicity) that may influence determinations of thresholds for specific pollutants.

For pollutants such as HCl that are considered to have a "threshold of safety" below which adverse effects are not expected, the information on noncarcinogenic effects must be evaluated to determine the potential hazards associated with exposure to the pollutant. One approach for determining potential hazards of a pollutant is to use its Inhalation Reference Concentration (RfC). The RfC is defined as an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily inhalation exposure that, over a lifetime, would not likely result in the occurrence of noncancer health effects in humans. A health benchmark such as the RfC can be established by applying uncertainty factors to the critical toxic effect derived from the lowest or no-adverse-effect level of a pollutant (see EPA-600/8-90-066F, October 1994, Methods for Derivation of Inhalation Reference Concentrations and Applications of Inhalation Dosimetry). The confidence in the RfC (which is given a qualitative ranking of either high, medium, or low)

is based on the number of studies available and the quality of the data base, among other things.

The RfC for HCl is based on a single animal study, which used only one dose and had limited toxicological measurements. In that study, laboratory rats exposed to 15,000 $\mu\text{g}/\text{m}^3$ HCl for 6 hours per day, 5 days per week for life, developed an increased incidence of hyperplasia of the larynx and trachea, compared to controls (Health Assessment Document for Chlorine and Hydrogen Chloride, Review Draft; EPA-600/8-87/041A, August 1994). Effects on laboratory animals exposed to even higher concentrations of HCl for 90 days included damage to the organs of the respiratory system, but not to more distant organs. Chronic exposure studies involving lower concentrations (less than 15,000 $\mu\text{g}/\text{m}^3$) have not been done, nor have comprehensive epidemiological studies of humans (Health Assessment Document for Chlorine and Hydrogen Chloride, Review Draft; EPA-600/8-87/041A, August 1994).

The RfC for HCl is 20 $\mu\text{g}/\text{m}^3$ (EPA, 1995, Integrated Risk Information System (IRIS), Reference Concentration (RfC) for Inhalation Exposure for Hydrogen Chloride. National Center for Environmental Assessment, Cincinnati, OH. On-Line). This concentration is a low confidence RfC with an uncertainty factor of 300 applied to the lowest adverse effect level noted in animals (*Ibid*).

Generally, information on developmental and reproductive effects would provide additional confidence in the adequacy of the health benchmark for characterizing health risk. No information is available on the developmental or reproductive effects associated with HCl exposure in humans or animals. However, no additional uncertainty is applied for the lack of these studies because HCl that deposits in the lung is not expected to have any effects at sites distant from the lung. Hydrogen chloride, in solution, quickly dissociates to H^+ (which, in small doses, is buffered in the tissue or blood) and Cl^- (which is ubiquitous in the body). Therefore, HCl is expected to have only local effects at the site of initial deposition. Furthermore, HCl is not thought to be directly genotoxic (Health Assessment Document for Chlorine and Hydrogen Chloride, Review Draft; EPA-600/8-87/041A, August 1994).

Based on the information presented above, the Administrator has determined that HCl is a health threshold pollutant for the purpose of section 112(d)(4) of the Act. The Administrator also concludes that, in this case, the RfC is an appropriate threshold value for assessing risk to humans associated with exposure to this pollutant through inhalation.

c. Exposure Assessment. Based on emission tests of 14 kraft recovery furnaces, uncontrolled HCl emissions from DCE

and NDCE recovery furnaces range from 0 to 923 Mg/yr (0 to 1,016 tons/yr); however, the concentrations of HCl in recovery furnace exhaust gases (0.3 to 95.6 ppm_v) are relatively low due to the high volume of the exhaust gases. Chlorides enter the liquor cycle primarily through the wood used for pulping and the caustic used as makeup chemical during white liquor preparation, although mill process water can also be a significant contributor. A small portion of the chlorides in the black liquor fed to the recovery furnace can be emitted from the furnace as HCl gas. The remaining chlorides in the black liquor exit the recovery furnace as inorganic alkali salts, either as particulate in the exhaust gases or as a constituent of the smelt.

For sulfite combustion units, HCl emissions are negligible because acid-gas absorption systems are an integral part of the sulfite chemical recovery process. Hydrochloric acid emissions data are available for only one sulfite combustion unit; HCl emissions from this unit were approximately 1 ppm_v following the acid-gas absorption system. No data are available on HCl emissions prior to the acid-gas absorption systems. No HCl emission data are available for semichemical combustion units. However, neither process nor technical considerations indicate that HCl emissions would be significant.

Inputs for the exposure assessment model were developed for kraft and soda recovery furnaces, which have the higher HCl emissions. The inputs were developed using available test data and mill-specific process data. Estimated HCl emission rates were based on the highest available HCl emission factors (in units of kilograms [kg] of HCl per kg of black liquor solids fired) for both NDCE and DCE recovery furnaces. Because the HCl emission rates were based on mill-specific process data (e.g., black liquor solids firing rate), each recovery furnace type at each mill had a unique set of emissions estimates. Stack parameters (i.e., height, diameter, temperature and velocity) were based on information obtained from the AIRS data base; average values from AIRS were assigned to those sources for which AIRS data were not available. For mills with multiple recovery furnaces (e.g., two NDCE recovery furnaces), HCl emissions from the furnaces were summed, and the stack parameters for those recovery furnaces were averaged.

This exposure assessment was conducted following the principles described in the Agency's Exposure Assessment Guidelines (57 FR 22888, May 29, 1992). There is no expectation that the population will be exposed to higher long-term levels of HCl than those predicted by the model. In this case, a screening analysis was used to determine if emissions of HCl could result in exposures above Agency-

established health threshold concentrations. The assessment was conducted for 106 mills. The applied approach incorporates into the analysis ranges of values for those variables meeting the following criteria: where mathematical distributions are available; where the variables are independent; and, most importantly, where the variables are believed to significantly influence the results of the analysis. This probabilistic procedure uses Monte Carlo simulation to produce distributions with associated probability estimations (e.g., there is a 95 percent probability that the estimated exposure to the most exposed population group (census block) is less than the RfC for HCl).

The distributions used in the Monte Carlo analysis were taken primarily from EPA sources (such as the Exposure Factors Handbook; EPA/600/8-89/043, July 1989) and the literature. Best judgments were used in selecting the distributions and, in some cases, in using only portions of the distributions that are provided in the Handbook. Use of other distributions may result in different final outcomes for the Monte Carlo analysis.

The results of this analysis show that, at the 95 percent confidence interval, the maximum concentration predicted to which people are estimated to be exposed is

0.3 $\mu\text{g}/\text{m}^3$, 60 times less than the inhalation reference concentration.

In addition, terrain (e.g., hills and valleys) is known to affect concentration estimates predicted near facilities with elevated pollutant releases (e.g., stacks). The effect of terrain on estimated HCl concentrations was investigated by including terrain in the modeling of the ten recovery furnaces that produced the highest estimated HCl concentrations at census blocks in the exposure assessment described above. The terrain analysis and a Monte Carlo assessment similar to that described above resulted, at the 95 percent confidence interval, in a maximum concentration to which people are expected to be exposed of 2 $\mu\text{g}/\text{m}^3$, which is 10 times less than the inhalation reference concentration.

d. Ecological Assessment. The standards for emissions must also protect against significant and widespread adverse environmental effects to wildlife, aquatic life, and other natural resources. Approaches to ecological risk assessments are being developed and applied by EPA for several areas of concern regarding the effects of pollutants. For HCl emitted by these source categories, a formal ecological risk assessment as such has not been made. However, publications in the literature have been reviewed

to determine if there would be reasonable expectation for serious or widespread adverse effects to natural resources.

Aspects of pollutant exposure and effects that should be considered are: toxicity effects from acute and chronic exposures to expected concentrations around the source (as measured or modeled), persistence in the environment, local and long-range transport, and tendency for bio-magnification with toxic effects manifest at higher trophic levels.

No research has been identified for effects on terrestrial animal species beyond that cited in the development of the RfC. The evidence available to date, discussed in section IV.D.3.b of this preamble, indicates that HCl is a threshold pollutant for the purposes of section 112(d)(4) of the Act. Modeling calculations indicate that there is little likelihood of chronic or widespread exposure to HCl at concentrations above the threshold around pulp and paper mills. Based on these considerations, EPA believes that the RfC can reasonably be expected to protect against widespread adverse effects in other animal species as well.

Plants also respond to airborne HCl levels. Chronic exposure to about $600 \mu\text{g}/\text{m}^3$, can be expected to result in discernible effects, depending on the plant species. Plants respond differently to HCl as an anhydrous gas than to HCl aerosols. Relative humidity is important in plant response;

there appears to be a threshold of relative humidity above which plants will incur twice as much damage at a given dose (Medical and Biological Effects of Environmental Pollutants: Chlorine and Hydrogen Chloride, National Academy of Sciences, 1976). Effects include leaf injury and decrease in chlorophyll levels in various species given acute, 20-minute exposures of 6,500 to 27,000 $\mu\text{g}/\text{m}^3$ (Health Assessment Document for Chlorine and Hydrogen Chloride, Review Draft; EPA-600/8-87/041A, August 1994). A field study reports different sensitivity to damage of foliage in 50 species growing in the vicinity of an anhydrous aluminum chloride manufacturer. American elm, bur oak, eastern white pine, basswood, red ash and several bean species were observed to be most sensitive. Concentrations of HCl in the air were not reported. Chloride ion in whole leaves was 0.2 to 0.5 percent of dry weight; sensitive species showed damage at the lower value, but tolerant species displayed no injury at the higher value. Injury declined with distance from the source with no effects observed beyond 300 meters (Harper and Jones, 1982, "The relative Sensitivity of Fifty Plant Species to Chronic Doses of Hydrogen Chloride," *Phytopathology* 72: 261-262).

Prevailing meteorology strongly determines the fate of HCl in the atmosphere (Health Assessment Document for Chlorine and Hydrogen Chloride, Review Draft;

EPA-600/8-87/041A, August 1994). However, HCl is not considered a strongly persistent pollutant, or one where long range transport is important in predicting its ecological effects. In the atmosphere, HCl can be expected to be absorbed into aqueous aerosols, due to its great affinity for water, and removed from the troposphere by rainfall. In addition, HCl will react with hydroxy ions to yield water plus chloride ions. However, the concentration of hydroxy ions in the troposphere is low, so HCl may have a relatively long residence time in areas of low humidity. No studies are reported of HCl levels in ponds or other small water bodies or soils near major sources of HCl emissions. Toxic effects of HCl to aquatic organisms would likely be due to the hydronium ion, or acidity. Aquatic organisms in their natural environments often exhibit a broad range of pH tolerance. Effects of HCl deposition to small water bodies and to soils will primarily depend on the extent of neutralizing by carbonates or other buffering compounds (Health Assessment Document for Chlorine and Hydrogen Chloride, Review Draft; EPA-600/8-87/041A, August 1994). Chloride ions are essentially ubiquitous in natural waters and soils, so minor increases due to deposition of dissolved HCl will have much less effect than the deposited hydronium ions. Deleterious effects of HCl on ponds and soils, where such effects might be found near a major source emitting to

the atmosphere, likely will be local rather than widespread, as observed in plant foliage.

Effects of HCl on tissues are generally restricted to those immediately impacted and are essentially acidic effects. The rapid solubility of HCl in aqueous media releases hydronium ions, which can be corrosive to tissue when above a threshold concentration. The chloride ions may be concentrated in some plant tissues, but may be distributed throughout the organism, as most organisms have chloride ions in their fluids. Leaves or other tissues exposed to HCl may show some concentration above that of their immediate environment; that is, some degree of bioconcentration can occur. However, long-term storage in specific organs and biomagnification of concentrations of HCl in trophic levels of a food chain would not be expected. Thus, the chemical nature of HCl results in deleterious effects, that when present, are local rather than widespread.

e. Conclusions. The results of the exposure assessment modelling showed exposure levels to HCl emissions from kraft and soda recovery furnaces below the health threshold value. Furthermore, the threshold value, for which the RfC was determined to be an appropriate value, was not exceeded when taking into account an ample margin of safety. Finally, no significant or widespread adverse

environmental effects from HCl are anticipated. Therefore, the Agency, under authority of section 112(d)(4), has determined that further control of HCl emissions from kraft and soda recovery furnaces and sulfite and semichemical combustion units is not necessary.

E. Determination of Subcategories and MACT Floors

The first step in establishing MACT floors is to determine whether the source category warrants subcategorization. In evaluating the chemical recovery process for subcategorization, the Agency took into consideration the type of equipment used in the process, the emission potential of each emission point, and any variations in the process due to pulp type. The Agency determined that the chemical recovery areas at kraft and soda pulp mills do not warrant subcategorization because the recovery areas are comparable in processes, equipment, and HAP emissions. The Agency determined that separate subcategories are warranted for sulfite and stand-alone semichemical pulp mills because the recovery processes used at sulfite and stand-alone semichemical pulp mills are specifically different from each other and from those used at kraft and soda pulp mills.

The proposed MACT floors for each category were established on an emission point basis. For existing sources at kraft and soda pulp mills, the MACT floor was

established by examining the emission level achievable by the control technology used by the source at the 94th percentile (i.e., the median emission limitation achieved by the top 12 percent of sources). Because there are fewer than 30 sulfite combustion units nationwide, the proposed MACT floor for existing sources at sulfite pulp mills was established by examining the emission level achieved by the control technology used by the best-performing five existing sources at sulfite pulp mills. The MACT floor approach used for existing sources at sulfite pulp mills was also used for existing sources at stand-alone semichemical pulp mills because there are fewer than 30 semichemical combustion sources. The MACT floor technologies for new sources at kraft, soda, sulfite, and stand-alone semichemical pulp mills are based on the best-performing similar source for each subcategory. The control technologies and corresponding emission levels that represent the proposed MACT floors were determined based on technology and emission data that were available to the Administrator.

1. MACT Floors--Kraft and Soda Pulp Mills

This section provides a brief description of the MACT floor determinations for kraft and soda NDCE recovery furnaces, DCE recovery furnace systems, lime kilns, and SDT's.

a. NDCE Recovery Furnaces. An estimated 128 NDCE recovery furnaces operate at 96 U.S. kraft and soda pulp mills. Information regarding the furnace type, size, and add-on control devices is available for approximately 88 percent of these recovery furnaces. Ninety-seven percent of NDCE recovery furnaces are equipped with an ESP, 2 percent are equipped with an ESP followed by a wet scrubber, and the remaining 1 percent are equipped with two wet scrubbers in series. The add-on control devices were installed primarily for control of PM emissions.

The following paragraphs describe the proposed MACT floor control technologies for new and existing kraft and soda NDCE recovery furnaces for both PM/PM HAP and total gaseous organic HAP control and the emission levels achievable with each proposed MACT floor technology.

(1) PM and PM HAP MACT Floors. Properly designed and operated ESP's used on kraft recovery furnaces routinely achieve PM removal efficiencies of 99 percent or greater. Although emission test data from recovery furnace ESP's on PM HAP performance are limited, available data on ESP performance indicate that those systems that achieve the greatest PM removal show the best performance for the HAP portion of the PM. (See Technical Support Document: Chemical Recovery Combustion Sources at Kraft and Soda Pulp

Mills, Chapter 3; docket entry No. II-A-31.) Therefore, PM can be used as a surrogate for PM HAP's.

The NSPS for kraft pulp mills requires that PM emissions from recovery furnaces constructed, reconstructed, or modified after September 24, 1976 be less than or equal to 0.10 g/dscm (0.044 gr/dscf) of flue gas corrected to 8 percent oxygen. Approximately 39 percent of NDCE recovery furnaces are subject to the NSPS, and even more (80 percent) reportedly achieve the NSPS limit.

Long-term (monthly) PM emission data are available for eight NDCE recovery furnaces. Particulate matter emissions from each of these eight NDCE recovery furnaces varied significantly from month to month; however, PM emissions from seven of the eight NDCE recovery furnaces consistently met the NSPS limit of 0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen over a 4- to 6-year period. Collectively, emissions from these seven NDCE recovery furnaces ranged from 0.002 to 0.10 g/dscm (0.001 to 0.044 gr/dscf), corrected to 8 percent oxygen. (See State of Washington Data Memo, docket entry No. II-B-59.) Thus, the long-term data demonstrate that NDCE recovery furnaces equipped with ESP's can meet the NSPS level of 0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen on a long-term basis. Because greater than 6 percent of NDCE recovery furnaces are capable of meeting the NSPS limit on a long-

term basis with ESP's, the proposed MACT floor PM control technology for existing kraft and soda NDCE recovery furnaces is an ESP capable of meeting the NSPS, which typically has a specific collecting area (SCA) of $100 \text{ m}^2/(\text{m}^3/\text{sec})$ ($530 \text{ ft}^2/1,000 \text{ acfm}$). The application of the proposed MACT floor PM control technology is represented by a PM emission level of 0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen.

The proposed MACT floor control technology for PM HAP is the same as the proposed MACT floor control technology for PM and is represented by a PM HAP emission level of $1.00\text{E-}03 \text{ kg/Mg}$ ($2.01\text{E-}03 \text{ lb/ton}$) of black liquor solids fired. The proposed MACT floor PM HAP emission level is based on available test data and is equivalent to the average PM HAP emission factor for recovery furnaces with PM emissions that achieve the NSPS level of 0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen.

With respect to MACT for new sources, the best-performing PM control system of the eight NDCE recovery furnaces for which long-term PM emission data are available is an ESP with an operating SCA between 110 and $130 \text{ m}^2/(\text{m}^3/\text{sec})$ (570 and $670 \text{ ft}^2/1,000 \text{ acfm}$) followed by a cross-flow, packed-bed scrubber. Monthly PM emissions data from the NDCE recovery furnace with this control system varied from 0.002 to 0.025 g/dscm (0.001 to 0.011 gr/dscf)

corrected to 8 percent oxygen over a 6-year period. Taking the variability of the data into consideration, a PM emission level of 0.034 g/dscm (0.015 gr/dscf) was selected to represent the MACT floor PM emission level for new NDCE recovery furnaces. Therefore, the proposed MACT floor PM control technology for new kraft and soda NDCE recovery furnaces is an ESP capable of achieving a PM emission level of 0.034 g/dscm (0.015 gr/dscf) corrected to 8 percent oxygen (i.e., an ESP with a typical SCA between 110 and 130 m²/[m³/sec] [570 and 670 ft²/1,000 acfm]) followed by a packed-bed scrubber.

Although the proposed MACT floor PM control technology for new NDCE recovery furnaces includes both the ESP and the cross-flow, packed-bed scrubber, the scrubber was installed as a heat recovery device and for SO₂ control and is not expected to provide much, if any, additional PM control. Because of the high PM removal efficiencies achievable with newer ESP's, the proposed MACT floor PM emission level of 0.034 g/dscm (0.015 gr/dscf) corrected to 8 percent oxygen for new NDCE recovery furnaces could be achieved with the application of the ESP alone.

A PM HAP emission level was not established for new NDCE recovery furnaces because insufficient PM HAP data are available from NDCE recovery furnaces representing MACT for new sources.

(2) Total Gaseous Organic HAP MACT Floors. The ESP systems applied to existing NDCE recovery furnaces conform to one of two designs: wet ESP systems or dry ESP systems. A wet ESP system uses unoxidized black liquor or water in the ESP bottom or in the PM return system. A dry ESP system includes both a dry-bottom ESP and a dry PM return system. Wet ESP systems that use black liquor or HAP-contaminated water emit higher levels of gaseous organic HAP's than dry ESP systems due to the stripping of gaseous organic HAP's from the black liquor or HAP-contaminated water in the ESP bottom or PM return system. Based on the available emission data, NDCE recovery furnaces with dry ESP systems emit, on average, approximately 72 percent less total gaseous organic HAP's than NDCE recovery furnaces with wet ESP systems.

Although information is available to classify almost all (99 percent) of NDCE recovery furnace ESP's as wet- or dry-bottom, little information is available regarding the use of black liquor or HAP-contaminated water in the recovery furnace ESP PM return systems. Based on the limited available information on ESP return systems, approximately 5 percent of NDCE recovery furnaces are estimated to be equipped with dry ESP systems. Because the estimated percentage of NDCE recovery furnaces equipped with dry ESP systems is less than 6 percent, the proposed MACT floor control technology for total gaseous organic HAP

emissions from existing kraft and soda NDCE recovery furnaces is a wet ESP system, and, thus, no control of total gaseous organic HAP's is achieved at the floor. However, because NDCE recovery furnaces equipped with dry ESP systems represent the best-controlled source for total gaseous organic HAP emissions, the proposed MACT floor total gaseous organic HAP control technology for new kraft and soda NDCE recovery furnaces is a dry ESP system. Emission data from three NDCE recovery furnaces equipped with dry ESP systems indicate that a total gaseous organic HAP emission level, as measured by methanol, of 0.012 kg/Mg (0.025 lb/ton) of black liquor solids fired or less is achievable. The methanol emission level corresponds to the highest three-run average obtained for a dry ESP system on an NDCE recovery furnace plus an additional amount to account for the variability in the dry ESP system data set and the lack of long-term data. Therefore, the total gaseous organic HAP emission level, as measured by methanol, associated with the proposed MACT floor control technology (i.e., a dry ESP system) is 0.012 kg/Mg (0.025 lb/ton) of black liquor solids fired.

b. DCE Recovery Furnace Systems. The DCE recovery furnace system includes the recovery furnace, DCE, and the BLO system. An estimated 83 DCE recovery furnaces are in operation at 48 U.S. kraft and soda pulp mills. An estimated 46 BLO systems are in operation at these 48 pulp

mills. Of the two mills without BLO systems, one is a soda pulp mill, and the other is a kraft pulp mill. Information regarding the furnace type, size, and add-on control devices and the associated BLO systems is available for approximately 93 percent of DCE recovery furnace systems.

Like NDCE recovery furnaces, all DCE recovery furnaces are equipped with some type of add-on control device to reduce PM emissions from the furnace. In the case of DCE units, 90 percent are controlled with an ESP, 8 percent are controlled with an ESP followed by a wet scrubber, and the remaining 2 percent are controlled with two ESP's in series. As with NDCE recovery furnaces, MACT floor control technologies for DCE recovery furnace systems were selected for both PM/PM HAP and total gaseous organic HAP emissions. The following paragraphs describe the proposed MACT floor control technologies for new and existing kraft and soda DCE recovery furnace systems and the emission levels achievable with each proposed MACT floor technology.

(1) PM and PM HAP MACT Floors. As discussed above for NDCE recovery furnaces, properly designed and operated ESP's used on kraft recovery furnaces routinely achieve PM removal efficiencies of 99 percent or greater. Using installation dates to determine NSPS applicability, three DCE recovery furnaces (i.e., 4 percent of the DCE recovery furnace population) are subject to the NSPS emission limit of

0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen for kraft recovery furnaces. Long-term (monthly) PM emission data are available for an additional four DCE recovery furnaces that are not subject to the NSPS but have consistently met the NSPS emission level of 0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen over a 3- to 6-year period, even though PM emissions from each of these four DCE recovery furnaces varied significantly from month to month. Collectively, the PM emissions from these four DCE recovery furnaces varied from 0.011 to 0.10 g/dscm (0.005 to 0.044 gr/dscf) corrected to 8 percent oxygen over the 3- to 6-year period. (See State of Washington Data Memo; docket entry No. II-B-59.) The combination of those DCE recovery furnaces subject to the NSPS and those for which data show an ability to achieve the NSPS level on a long-term basis represent a total of seven DCE recovery furnaces, or 9 percent of the DCE recovery furnace population.

Because greater than 6 percent of DCE recovery furnaces are capable of meeting the NSPS PM limit on a long-term basis with ESP's, the proposed MACT floor PM control technology for existing kraft and soda DCE recovery furnace systems is an ESP capable of meeting the NSPS, which typically has an SCA of $90 \text{ m}^2/(\text{m}^3/\text{sec})$ ($430 \text{ ft}^2/1,000 \text{ acfm}$). The application of the proposed MACT floor PM control

technology is represented by a PM emission level of 0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen.

The proposed MACT floor control technology for PM HAP is the same as the proposed MACT floor control technology for PM and is represented by a PM HAP emission level of $1.00\text{E-}03$ kg/Mg ($2.01\text{E-}03$ lb/ton) of black liquor solids fired. As with existing NDCE recovery furnaces, the proposed MACT floor PM HAP emission level is equivalent to the average PM HAP emission factor for kraft and soda recovery furnaces with PM emissions that achieve the NSPS level of 0.10 g/dscm (0.044 gr/dscf) corrected to 8 percent oxygen.

The best-performing PM control system for both NDCE and DCE recovery furnaces is an ESP with an operating SCA between 110 and 130 $\text{m}^2/(\text{m}^3/\text{sec})$ (570 and 670 $\text{ft}^2/1,000$ acfm) followed by a cross-flow, packed-bed scrubber. Monthly PM emissions data from the recovery furnace with this control system varied from 0.002 to 0.025 g/dscm (0.001 to 0.011 gr/dscf) corrected to 8 percent oxygen over a 6-year period. Taking the variability of the data into consideration, a PM emission level of 0.034 g/dscm (0.015 gr/dscf) was selected to represent the MACT floor PM emission level for new DCE recovery furnaces. Therefore, the proposed MACT floor PM control technology for all new kraft and soda DCE recovery furnaces is an ESP capable of

achieving a PM emission level of 0.034 g/dscm (0.015 gr/dscf) corrected to 8 percent oxygen (i.e., an ESP with a typical SCA between 110 and 130 m²/[m³/sec] [570 and 670 ft²/1,000 acfm]) followed by a packed-bed scrubber.

Although the proposed MACT floor PM control technology for new kraft and soda DCE recovery furnaces includes both the ESP and the cross-flow, packed-bed scrubber, the scrubber was installed as a heat recovery device and for SO₂ control and is not expected to provide much, if any, additional PM control. Because of the high PM removal efficiencies achievable with newer ESP's, the proposed MACT floor PM emission level of 0.034 g/dscm (0.015 gr/dscf) corrected to 8 percent oxygen for new DCE recovery furnaces could be achieved with the application of the ESP alone.

The EPA is not proposing a MACT floor PM HAP emission level for new kraft and soda DCE recovery furnaces for the same reason stated above for new NDCE recovery furnaces.

(2) Total Gaseous Organic HAP MACT Floors. Four of the estimated 46 BLO systems in operation are pipeline molecular oxygen-based systems, which have no emission points. No emission data are available from DCE recovery furnaces with molecular oxygen BLO systems for comparison with DCE recovery furnaces with air-based BLO systems. Therefore, the effect of molecular oxygen BLO systems on total emissions from the DCE recovery furnace system is

uncertain. With air-based BLO systems, gaseous organic HAP's are stripped from the black liquor and emitted to the atmosphere as the air bubbles and black liquor make contact. Unlike air-based systems, molecular oxygen systems use pure oxygen, and, thus, no diluents are introduced that could strip organic compounds from the black liquor; consequently, organic compounds not released from the black liquor during the oxidation process could be subsequently stripped, in theory, from the oxidized black liquor when the black liquor enters the direct contact evaporator. For this reason, molecular oxygen BLO systems are not viewed by the Agency as a control option for DCE recovery furnace systems.

The gaseous organic HAP emissions from 2 of the estimated 42 air-based BLO systems are controlled via incineration in power boilers; the remainder are uncontrolled. However, the two air-based BLO units with controlled emissions represent less than 6 percent of DCE recovery furnace systems. Therefore, the proposed MACT floor for total gaseous organic HAP control for existing kraft and soda DCE recovery furnace systems is no control.

The DCE recovery furnace systems emit more gaseous organic HAP's than NDCE recovery furnaces because more opportunities exist for gaseous organic HAP compounds to be stripped from the black liquor. In DCE systems, gaseous organic HAP compounds can be stripped from the black liquor

in the BLO system, the DCE, and the ESP system. Based on the available emission data, NDCE recovery furnaces with dry ESP systems emit approximately 93 percent less total gaseous organic HAP's than DCE recovery furnace systems.

The NDCE recovery furnaces with dry ESP systems also have lower TRS emissions compared to DCE recovery furnace systems. The need for TRS emission reductions and the need for additional recovery furnace capacity have resulted in mills converting older and smaller DCE units into larger NDCE units. Approximately 24 percent of the existing NDCE recovery furnaces are converted DCE recovery furnaces. For these reasons, and also because NDCE recovery furnaces are more energy efficient than DCE recovery furnaces, all new recovery furnace installations are of the NDCE design. Because of its lower HAP emission potential, an NDCE recovery furnace equipped with a dry ESP system was selected as the MACT floor total gaseous organic HAP control technology for all new kraft and soda NDCE recovery furnaces and DCE recovery furnace systems. This proposed MACT floor control technology is capable of achieving a total gaseous organic HAP emission level, as measured by methanol, of 0.012 kg/Mg (0.025 lb/ton) of black liquor solids fired.

c. Lime Kilns. An estimated 192 lime kilns operate at 124 U.S. kraft and soda pulp mills. Information regarding the lime kiln type, size, and add-on control devices is

available for approximately 85 percent of these lime kilns. All of the add-on control systems in place on lime kilns are for the control of PM or TRS emissions. No add-on controls designed to remove gaseous organic HAP's are applied to lime kilns.

Gaseous organic HAP emissions from lime kilns are primarily attributable to the use of HAP-contaminated process waters in the lime mud washers and lime kiln scrubbers. Therefore, gaseous organic HAP emissions from lime kilns can be minimized by reducing the HAP content of process waters used in the lime mud washers and scrubbers. These process waters are being regulated as part of the final NESHAP for noncombustion sources at pulp and paper mills. Therefore, no MACT floor has been established for total gaseous organic HAP's for new and existing kraft and soda lime kilns as part of this proposed NESHAP. The following paragraphs describe the proposed MACT floor PM/PM HAP control technologies and the associated emission levels for existing and new kraft and soda lime kilns.

Particulate matter emissions from most (90 percent) of the lime kilns are controlled by wet scrubbers. Venturi scrubbers are the most common type of wet scrubber in use on lime kilns. Particulate matter emissions from the remaining 10 percent of lime kilns are controlled by ESP's (9 percent) or the combination of an ESP and wet scrubber (1 percent).

Properly designed and operated venturi scrubbers and ESP's used on kraft lime kilns are capable of reducing PM emissions by greater than 99 percent.

The NSPS for kraft pulp mills requires that PM emissions from gas-fired lime kilns constructed, reconstructed, or modified after September 24, 1976 be less than or equal to 0.15 g/dscm (0.067 gr/dscf) of flue gas corrected to 10 percent oxygen. Approximately 19 percent of lime kilns are subject to the NSPS limit for gas-fired lime kilns, and even more (i.e., 64 percent of all lime kilns, including oil-fired lime kilns) have reported average PM emissions less than the gas-fired NSPS limit.

Long-term (monthly) PM emission data are available for four gas-fired lime kilns that are subject to the NSPS PM limit for gas-fired lime kilns. No long-term data are available for oil-fired lime kilns. Two of the four lime kilns for which long-term PM emission data are available are equipped with venturi scrubbers, and two are equipped with ESP's. Particulate matter emissions from the four lime kilns varied from 0.002 to 0.15 g/dscm (0.001 to 0.067 gr/dscf) corrected to 10 percent oxygen over a 4- to 7-year period. The long-term data demonstrate that existing lime kilns equipped with either venturi scrubbers or ESP's can meet an emission level of 0.15 g/dscm (0.067 gr/dscf) corrected to 10 percent oxygen on a long-term basis.

Because greater than 6 percent of lime kilns are capable of meeting the gas-fired NSPS limit on a long-term basis with venturi scrubbers or ESP's, the proposed MACT floor control technology for existing kraft and soda lime kilns is either a venturi scrubber or an ESP. The application of these proposed MACT floor PM control technologies is represented by a PM emission level of 0.15 g/dscm (0.067 gr/dscf) corrected to 10 percent oxygen. The proposed MACT floor control technology for PM HAP is the same as the proposed MACT floor control technology for PM and is represented by a PM HAP emission level of 6.33E-03 kg/Mg (1.27E-02 lb/ton) of CaO produced. The proposed MACT floor PM HAP emission level is equivalent to the average PM HAP emission factor for lime kilns with outlet PM emissions that achieve the NSPS level of 0.15 g/dscm (0.067 gr/dscf) corrected to 10 percent oxygen.

Of the four lime kilns for which long-term PM emission data are available, the best-performing PM control system is an ESP with an operating SCA of 220 m²/(m³/sec) (1,120 ft²/1,000 acfm), which is substantially higher than the typical SCA for an ESP designed to meet the NSPS (i.e., 90 m²/[m³/sec] [460 ft²/1,000 acfm]). The monthly PM emissions from the best-performing lime kiln varied from 0.002 to 0.018 g/dscm (0.001 to 0.008 gr/dscf) corrected to 10 percent oxygen over a 7-year period. To account for the

variability in the data, a PM emission level of 0.023 g/dscm (0.010 gr/dscf) was selected to represent the MACT floor PM emission level for new lime kilns. Therefore, the proposed MACT floor PM HAP control technology for new kraft and soda lime kilns is an ESP capable of achieving a PM emission level of 0.023 g/dscm (0.010 gr/dscf) corrected to 10 percent oxygen (i.e., an ESP with a typical SCA of $220 \text{ m}^2/[\text{m}^3/\text{sec}]$ [$1,120 \text{ ft}^2/1,000 \text{ acfm}$]).

A MACT floor PM HAP emission level was not established for new lime kilns for the same reasons stated above for new NDCE recovery furnaces.

d. Smelt Dissolving Tanks. An estimated 227 SDT's operate at 124 U.S. kraft and soda pulp mills. Information regarding the SDT size and add-on control devices is available for approximately 83 percent of the SDT's. The add-on control systems in place on SDT's are for control of PM emissions. No add-on controls designed to remove gaseous organic HAP's are applied to SDT's.

As discussed above for lime kilns, gaseous organic HAP emissions from SDT's are primarily the result of the use of HAP-contaminated process waters. The HAP-contaminated process waters are typically used in the SDT scrubbers as makeup water to the SDT. Therefore, gaseous organic HAP emissions from SDT's can be minimized by reducing the HAP content of process waters used in the SDT and SDT scrubber.

However, as stated above for lime kilns, the control of HAP emissions from process waters is being regulated as part of the final NESHAP for noncombustion sources at pulp and paper mills. Therefore, no MACT floor has been established for total gaseous organic HAP emissions for new and existing kraft and soda SDT's as part of this proposed NESHAP.

Particulate matter emissions from most (87 percent) of the SDT's are controlled by wet scrubbers. Particulate matter emissions from the majority of the remaining SDT's are controlled by mist eliminators. Based on the available performance data for wet scrubbers and mist eliminators installed on SDT's, wet scrubbers are more effective at controlling PM emissions from SDT's than mist eliminators. (See Technical Support Document: Chemical Recovery Combustion Sources at Kraft and Soda Pulp Mills, Chapter 3; docket entry No. II-A-31.) Properly designed wet scrubbers used on kraft SDT's are capable of reducing PM emissions by greater than 99 percent.

The NSPS for kraft pulp mills require that PM emissions from SDT's that are constructed, modified, or reconstructed after September 24, 1976 be less than 0.10 kg/Mg (0.20 lb/ton) of black liquor solids fired. Approximately 29 percent of SDT's are subject to the NSPS PM limit, and even more (75 percent) have reported average PM emissions less than the NSPS PM limit. Although no long-term PM

emission data are available for SDT's equipped with wet scrubbers that are subject to the NSPS limit of 0.10 kg/Mg (0.20 lb/ton) of black liquor solids fired, the prevalence of wet scrubbers on SDT's and the high PM removal efficiencies achieved with this technology are sufficient to establish wet scrubbers as the proposed MACT floor PM control technology for existing kraft and soda SDT's. The application of this control technology is represented by a PM emission level of 0.10 kg/Mg (0.20 lb/ton) of black liquor solids fired. The proposed MACT floor control technology for PM HAP is the same as the proposed MACT floor control technology for PM and is represented by a PM HAP emission level of 6.20E-05 kg/Mg (1.24E-04 lb/ton) of black liquor solids fired. The proposed MACT floor PM HAP emission level is equivalent to the average PM HAP emission factor for SDT's with outlet PM emissions that achieve the NSPS PM level of 0.10 kg/Mg (0.20 lb/ton) of black liquor solids fired.

Long-term (monthly) PM emission data are available for three SDT's equipped with wet scrubbers designed to meet a PM permit limit (0.06 kg/Mg [0.12 lb/ton] of black liquor solids fired) that is more stringent than the NSPS. The high-efficiency wet scrubbers installed on these three SDT's represent the best-performing PM control systems installed on kraft and soda SDT's. Collectively, monthly PM emissions

from these three SDT's varied from 0.0045 to 0.055 kg/Mg (0.009 to 0.11 lb/ton) of black liquor solids fired over a 2- to 6- year period. (See State of Washington Data Memo, docket entry No. II-B-59.) The long-term data demonstrate that SDT's equipped with high-efficiency wet scrubbers can achieve a maximum outlet PM level of 0.06 kg/Mg (0.12 lb/ton) of black liquor solids fired on a long-term basis. Therefore, the proposed MACT floor PM HAP control technology for new kraft and soda SDT's is a high-efficiency wet scrubber capable of achieving a PM emission level of 0.06 kg/Mg (0.12 lb/ton) of black liquor solids fired.

2. MACT Floors--Sulfite Pulp Mills

An estimated 21 combustion units operate at sulfite pulp mills. Information regarding the chemical recovery equipment and add-on control devices is available for approximately 95 percent of these combustion units. Because there are less than 30 sulfite combustion units, the MACT floor for existing sources is based on the 5 best-performing sources. Thirteen of the 21 sulfite combustion units (62 percent) are equipped with fiber-bed demister systems. The remainder of the combustion units are equipped with venturi scrubbers or packed-bed scrubbers. These add-on control devices were installed on sulfite combustion units for PM control and additional SO₂ control. All sulfite combustion units are equipped with absorption towers prior

to the PM control device to recover SO₂ for reuse in the pulping process.

Long-term PM emission data are available for two sulfite combustion units equipped with fiber-bed demister systems. Based on these long-term data and additional long-term data for sulfite combustion units equipped with wet scrubbers, fiber-bed demister systems are more effective than wet scrubbers at controlling PM emissions from sulfite combustion units. Monthly PM emission data from the two sulfite combustion units equipped with fiber-bed demister systems ranged from 0.005 to 0.088 g/dscm (0.002 to 0.038 gr/dscf) corrected to 8 percent oxygen over a 6- to 7-year period. Because the fiber-bed demister system represents the best-performing control technology and at least five sources are equipped with fiber-bed demister systems, this technology was selected to represent the proposed MACT floor control technology for existing sulfite combustion units. To account for variability in the data, a PM emission level of 0.092 g/dscm (0.040 gr/dscf) corrected to 8 percent oxygen was selected to represent the MACT floor PM emission level for existing sulfite combustion units.

Monthly PM emission data from the best-performing sulfite combustion unit equipped with a fiber-bed demister system ranged from 0.009 to 0.039 g/dscm (0.004 to 0.017 gr/dscf) corrected to 8 percent oxygen over a 6-year

period. This sulfite combustion unit also is equipped with a wet scrubber between the SO₂ absorption towers and the fiber-bed demister system. The scrubber was added to the system for additional PM and SO₂ control. Because the best-performing source is equipped with a wet scrubber and fiber-bed demister system, the combination of these technologies was selected to represent the proposed MACT floor control technology for new sulfite combustion units. To account for the variability in the data, a PM emission level of 0.046 g/dscm (0.020 gr/dscf) corrected to 8 percent oxygen was selected to represent the MACT floor PM emission level for new sulfite combustion units.

3. MACT Floors--Stand-Alone Semichemical Pulp Mills

An estimated 14 chemical recovery combustion units operate at 13 U.S. stand-alone semichemical pulp mills. Information regarding the design and operation of chemical recovery combustion units is available for all of these units. Although chemical recovery combustion units at stand-alone semichemical pulp mills are equipped with a variety of PM control devices, insufficient PM data and no PM HAP data are available to establish MACT floors for PM or PM HAP. In addition, none of the existing semichemical mills are currently controlling gaseous organic HAP emissions from semichemical combustion sources. Therefore,

no control of total gaseous organic HAP emissions is achieved at the MACT floor for existing or new sources.

However, the Agency has selected a beyond-the-floor option to represent MACT for gaseous organic HAP control for existing and new semichemical combustion sources. The beyond-the-floor option is based on the use of an RTO preceded by a wet ESP. (A wet ESP or other PM control device is necessary because the RTO requires a high degree of PM control for proper operation.) Pilot study results at a stand-alone semichemical mill indicate that an RTO is well-suited to reducing gaseous organic HAP emissions from fluidized-bed reactors, which emit the highest known quantities of HAP's of the combustion technologies currently in use at semichemical pulp mills. The semichemical mill that conducted the pilot study is currently installing a full-scale RTO based on the results of the pilot study.

During the pilot study, the RTO reduced THC emissions from the mill's fluidized-bed reactor by an average of 97 percent. However, because the RTO has not yet been demonstrated full-scale at a semichemical mill, EPA estimated the total gaseous organic HAP emission level that corresponds to MACT using the average THC emission reduction (90 percent) achieved during the pilot study test run with the lowest level of control. The estimated 90 percent THC emission reduction was applied to the average uncontrolled

THC emissions (measured as carbon) from a fluidized-bed reactor. Based on the results of the calculation, the application of an RTO preceded by a wet ESP is estimated to be representative of either a total gaseous organic HAP emission level of 1.49 kg/Mg (2.97 lb/ton) of black liquor solids fired, or a 90 percent reduction in total gaseous organic HAP emissions. (Total gaseous organic HAP's are measured as THC, as carbon, in both cases.)

F. Discussion of Regulatory Alternatives

The proposed standards were selected based on a review of the regulatory alternatives developed for the affected sources. Table 3 presents the regulatory alternatives examined for existing affected sources at kraft and soda pulp mills; Tables 4 and 5 present the regulatory alternatives for existing affected sources at sulfite and stand-alone semichemical pulp mills, respectively. For existing affected sources, regulatory alternative I (RA I) represents the proposed MACT floor, and additional regulatory alternatives represent beyond-the-MACT-floor options. The regulatory alternatives are increasingly more stringent in terms of total HAP emission reduction requirements. The most stringent regulatory alternative examined for existing sources is representative of MACT for new sources. A discussion of the regulatory alternatives is provided below.

TABLE 3. REGULATORY ALTERNATIVES FOR EXISTING AFFECTED SOURCES AT KRAFT AND SODA PULP MILLS

Regulatory alternatives (RA)	Basis of alternative			
	Recovery furnace systems		Smelt dissolving tanks	Lime kilns
	NDCE	DCE		
RA I (MACT floor for existing sources)	NDCE recovery furnace with ESP ₁	DCE recovery furnace with ESP ₁	Wet scrubber ₁	ESP ₁ or wet scrubber ₁
RA II	NDCE recovery furnace with ESP ₁	DCE recovery furnace with ESP ₁ plus BLO vent controlled by incineration	Wet scrubber ₁	ESP ₁ or wet scrubber ₁
RA III	NDCE recovery furnace with dry ESP ₁ system	NDCE recovery furnace with dry ESP ₁ system	Wet scrubber ₁	ESP ₁ or wet scrubber ₁
RA IV (MACT floor for new sources) ^a	NDCE recovery furnace with dry ESP ₂ system and packed-bed scrubber	NDCE recovery furnace with dry ESP ₂ system and packed-bed scrubber	Wet scrubber ₂	ESP ₂

^aTighter PM control is achieved for new sources through the use of a more efficient ESP design (ESP₂) or scrubber design (wet scrubber₂) than that used under regulatory alternatives I through III (ESP₁ or wet scrubber₁) for existing sources.

TABLE 4. REGULATORY ALTERNATIVES FOR EXISTING AFFECTED SOURCES AT SULFITE PULP MILLS

Regulatory alternatives (RA)	Basis of alternative
RA I (MACT floor for existing sources)	Fiber-bed demister system
RA II (MACT floor for new sources)	Wet scrubber followed by fiber-bed demister system

TABLE 5. REGULATORY ALTERNATIVES FOR EXISTING AFFECTED SOURCES AT SEMICHEMICAL PULP MILLS

Regulatory alternatives (RA)	Basis of alternative
RA I (MACT floor for existing and new sources)	No control
RA II (Beyond-the-MACT floor for existing and new sources)	Wet ESP followed by regenerative thermal oxidizer

1. Kraft and Soda Pulp Mills

As shown in Table 5, four regulatory alternatives were considered for MACT selection for affected sources at kraft and soda pulp mills. The first regulatory alternative (RA I) represents the proposed MACT floor for existing affected sources, and the other three alternatives (RA II, RA III, and RA IV) represent beyond-the-MACT-floor options. Each of these regulatory alternatives is discussed below by emission point.

a. NDCE Recovery Furnaces. For NDCE recovery furnaces, the regulatory alternatives are based on two levels of PM HAP control and two levels of total gaseous organic HAP control, as measured by methanol. Under RA I (proposed MACT floor for existing sources), PM HAP emissions would be controlled through the application of an ESP with a typical operating SCA of $100 \text{ m}^2/(\text{m}^3/\text{sec})$ ($530 \text{ ft}^2/1,000 \text{ acfm}$); the ESP would reduce PM HAP emissions by greater than 99 percent.

The regulatory alternatives RA II and RA III are based on the same PM HAP control equipment specifications for the NDCE recovery furnace as RA I (the proposed MACT floor); therefore, no further reduction in PM HAP emissions would be achieved under RA II and RA III than that achieved at the floor. However, under RA III, total gaseous organic HAP emissions would be controlled to levels beyond the proposed

MACT floor through the application of a dry ESP system (i.e., a dry-bottom ESP with a dry PM return system). The use of a dry ESP system would result in a reduction in total gaseous organic HAP emissions from those mills currently using wet ESP systems (i.e., wet-bottom ESP's or dry-bottom ESP's with wet PM return systems). Wet ESP systems emit greater quantities of gaseous organic HAP's because these compounds are stripped from the black liquor in the bottom of the ESP and in the PM return system.

The most stringent beyond-the-floor regulatory alternative (RA IV) combines the conversion of the ESP system with more stringent PM HAP control requirements for the furnace. The more stringent PM HAP control would be obtained through the application of an ESP followed by a packed-bed scrubber; the typical operating SCA of the ESP would be between 110 and 130 $\text{m}^2/(\text{m}^3/\text{sec})$ (570 and 670 $\text{ft}^2/1,000 \text{ acfm}$). Although the packed-bed scrubber is capable of reducing HCl emissions from the NDCE recovery furnace by as much as 99 percent, as stated in section IV.E.1.a of this preamble, the ESP could be used alone to meet the PM emission limit for new NDCE recovery furnaces because the scrubber removes little, if any, of the PM remaining in the gas stream exiting the ESP. Because the PM HAP control costs for RA IV are based on an ESP followed by a packed-bed scrubber, those costs are overstated.

Regulatory alternative IV is representative of the best-controlled similar source for NDCE recovery furnaces.

b. DCE Recovery Furnace Systems. For DCE recovery furnace systems, the regulatory alternatives are based on two levels of PM HAP control and three levels of total gaseous organic HAP control, as measured by methanol. Under the proposed MACT floor regulatory alternative RA I, PM HAP emissions would be reduced through the application of an ESP with a typical operating SCA of $90 \text{ m}^2/(\text{m}^3/\text{sec})$ ($430 \text{ ft}^2/1,000 \text{ acfm}$).

The beyond-the-floor regulatory alternative RA II is based on the same PM HAP control equipment specifications for the DCE recovery furnace as RA I; however, total gaseous organic HAP emissions also would be reduced by controlling the vent gases from air-based BLO systems to a beyond-the-floor level via incineration. The use of an incineration device such as a power boiler or thermal oxidizer could achieve total gaseous organic HAP emission reductions of 98 percent or greater from air-based BLO systems, which would translate to a 38 percent reduction of total gaseous organic HAP emissions from the entire DCE recovery furnace system.

The beyond-the-floor regulatory alternative RA III is based on the conversion of the DCE recovery furnace to an NDCE recovery furnace equipped with a dry ESP system with a

typical operating SCA of $100 \text{ m}^2/(\text{m}^3/\text{sec})$ ($530 \text{ ft}^2/1,000 \text{ acfm}$). The conversion of the DCE recovery furnace would reduce total gaseous organic HAP emissions from the DCE recovery furnace system by approximately 93 percent. No further reduction in PM HAP emissions would be achieved under RA III than that achieved at the floor (RA I) for DCE recovery furnaces.

The most stringent beyond-the-floor regulatory alternative (RA IV) combines the conversion of the DCE recovery furnace with more stringent PM HAP control requirements for the furnace. The more stringent PM HAP control requirements are based on an ESP with a typical operating SCA between 110 and $130 \text{ m}^2/(\text{m}^3/\text{sec})$ (570 and $670 \text{ ft}^2/1,000 \text{ acfm}$) followed by a packed-bed scrubber. Although the packed-bed scrubber is capable of reducing HCl emissions from the DCE recovery furnace by as much as 99 percent, as stated in section IV.E.1.a of this preamble, the ESP could be used alone to meet the PM emission limit for new recovery furnaces because the scrubber removes little, if any, of the PM remaining in the gas stream exiting the ESP. Because the PM HAP control costs for RA IV are based on an ESP followed by a packed-bed scrubber, those costs are overstated. Regulatory alternative IV is representative of the best-controlled similar source for DCE recovery furnace systems.

c. Smelt Dissolving Tanks. For SDT's, the regulatory alternatives are based on two levels of PM HAP control. Regulatory alternatives I through III are based on the use of a wet scrubber designed to meet the NSPS PM emission level. The beyond-the-floor regulatory alternative RA IV is based on the use of a high-efficiency wet scrubber designed to reduce PM emissions from SDT's. Based on current information, no controls more stringent than the use of high-efficiency wet scrubbers are being applied to SDT's.

d. Lime Kilns. Two PM HAP control levels were considered for lime kilns. Under regulatory alternatives I through III, the PM control level is based on the level achievable with a wet scrubber or an ESP designed to meet the NSPS. Under the beyond-the-floor regulatory alternative RA IV, increased PM control is obtained through the application of an ESP with a typical operating SCA of $220 \text{ m}^2/(\text{m}^3/\text{sec})$ ($1,120 \text{ ft}^2/1,000 \text{ acfm}$).

2. Sulfite Pulp Mills

As shown in Table 4, two regulatory alternatives were considered for sulfite combustion units. Both of these alternatives would reduce PM HAP emissions from the sulfite combustion unit. Regulatory alternative I represents the proposed MACT floor for existing sulfite combustion units and is based on the use of a fiber-bed demister system. Regulatory alternative II is more stringent than the

proposed MACT floor option and is based on the use of a wet scrubber followed by a fiber-bed demister system.

3. Stand-alone Semichemical Pulp Mills

As shown in Table 5, two regulatory alternatives for total gaseous organic HAP's were considered for combustion sources at stand-alone semichemical pulp mills. Regulatory alternative I represents the MACT floor for existing sources, which is no control. Regulatory alternative II is more stringent than the MACT floor option and is based on the use of a wet ESP followed by an RTO to reduce HAP emissions from the semichemical combustion units.

G. Selection of Proposed Standards for Existing and New Sources

1. Existing Sources

The proposed standards for each emission point are based on the emission level achievable when MACT is applied to that source. For existing sources, MACT was determined by evaluating the regulatory alternatives presented in Tables 3 through 5. The Agency selected RA I, or the MACT floor alternative, as MACT for existing sources at kraft, soda, and sulfite pulp mills. The decision to select RA I was based on a comparison of the costs and benefits of the regulatory alternatives for existing sources at kraft, soda, and sulfite pulp mills. The Agency concluded that the benefits of additional controls beyond the MACT floor for

kraft, soda, and sulfite pulp mills do not outweigh the high capital costs (shown in Tables 6 and 7).

TABLE 6. NATIONWIDE COSTS ASSOCIATED WITH REGULATORY ALTERNATIVES FOR KRAFT AND SODA AFFECTED SOURCES

Regulatory alternatives (RA)	Total capital investment, \$	Total annual cost, \$/yr
RA I (MACT floor for existing sources)	219,000,000	23,000,000
RA II (Beyond the floor for existing sources)	343,000,000	57,000,000
RA III (Beyond the floor for existing sources)	1,450,000,000	64,400,000
RA IV (Beyond the floor for existing sources; MACT floor for new sources)	2,080,000,000	152,000,000

TABLE 7. NATIONWIDE COSTS ASSOCIATED WITH REGULATORY ALTERNATIVES FOR SULFITE AFFECTED SOURCES

Regulatory alternatives (RA)	Total capital investment, \$	Total annual cost, \$/yr
RA I (MACT floor for existing sources)	11,400,000	5,120,000
RA II (Beyond the floor for existing sources; MACT floor for new sources)	19,600,000	8,770,000

TABLE 8. NATIONWIDE COSTS ASSOCIATED WITH REGULATORY ALTERNATIVES FOR SEMICHEMICAL AFFECTED SOURCES

Regulatory alternatives (RA)	Total capital investment, \$	Total annual cost, \$/yr
RA I (MACT floor for existing and new sources)	0	0
RA II (Beyond the floor for existing and new sources)	28,100,000	6,860,000

The Agency selected RA II, or the beyond-the-floor alternative, as MACT for existing sources at stand-alone semichemical pulp mills. The decision to select RA II was based on (1) the suitability of RTO technology for use with fluidized-bed reactors, which emit the highest quantities of gaseous organic HAP's of the chemical recovery combustion technologies currently in use at stand-alone semichemical pulp mills; (2) the plans of one semichemical mill to install a full-scale RTO system (preceded by a wet ESP) following a successful RTO pilot study; and (3) the low cost-effectiveness value associated with a combination wet ESP and RTO. (The cost-effectiveness value is less than \$2,800/Mg HAP's [\$2,500/ton HAP's] based on conservative cost estimates.) Table 8 presents the costs associated with the regulatory alternatives for existing sources at stand-alone semichemical pulp mills.

Information on the costs and environmental impacts of each alternative can be found in the memorandum entitled "Nationwide Costs, Environmental Impacts, and Cost-Effectiveness of Regulatory Alternatives for Kraft, Soda, Sulfite, and Semichemical Combustion Sources" (docket entry No. II-B-63). The economic impacts of each alternative are discussed in "Economic Analysis for the National Emission Standards for Hazardous Air Pollutants for Source Category: Pulp and Paper Production; Effluent Limitations Guidelines,

Pretreatment Standards, and New Source Performance Standards: Pulp, Paper, and Paperboard Category--Phase I" (docket entry No. II-A-32), hereafter referred to as the "Economic Analysis Document."

2. New Sources

The most stringent regulatory alternatives examined for existing sources (RA IV for kraft and soda pulp mills; RA II for sulfite pulp mills; and RA II for stand-alone semichemical pulp mills) are representative of MACT for new sources. The proposed standards are equivalent to the emission level achieved by the application of MACT. The proposed new source MACT for kraft and soda pulp mills is represented by (1) an NDCE recovery furnace equipped with a dry ESP system with an SCA between 110 and 130 $\text{m}^2/(\text{m}^3/\text{sec})$ (570 and 670 $\text{ft}^2/1,000$ acfm) followed by a packed-bed scrubber for both NDCE and DCE recovery furnaces, (2) a wet scrubber designed to meet a PM emission limit of 0.06 kg/Mg (0.12 lb/ton) of black liquor solids fired for SDT's, and (3) an ESP with an SCA of 220 $\text{m}^2/(\text{m}^3/\text{sec})$ (1,120 $\text{ft}^2/1,000$ acfm) for lime kilns. The proposed new source MACT for sulfite combustion units is represented by a wet scrubber followed by a fiber-bed demister system. The proposed new source MACT for semichemical combustion units is represented by a wet ESP followed by an RTO.

H. Selection of Format of the Standards

1. PM HAP Standards for Kraft and Soda Pulp Mills

In selecting the type and format of the proposed PM HAP standard for kraft and soda pulp mills, the Agency took into consideration the fact that the HAP fraction of the PM emitted was small (approximately 0.25 percent). Consequently today's proposed standards provide owners and operators of existing affected sources at kraft and soda pulp mills several alternatives for meeting the proposed PM HAP standards. Owners or operators of existing affected sources would be allowed to comply with either the PM or the PM HAP emission limit set for each source. In addition, as an alternative to meeting either the PM or PM HAP emission limits for each existing affected source, the proposed rule would allow owners or operators to comply with the PM HAP standards by using a bubble compliance alternative that groups PM or PM HAP emissions from all existing sources together. Under the proposed bubble compliance alternative, owners or operators could control PM or PM HAP emissions more than required at one emission point, where control costs are relatively low, in return for a comparable relaxation of controls at a second emission point where control costs are higher. This approach allows the owner or operator the maximum degree of flexibility in developing the PM or PM HAP control strategy for existing sources in the

chemical recovery area while reducing HAP emissions to the same levels that would be achieved through the application of MACT for each affected source.

The proposed bubble compliance alternative only applies to existing sources at kraft and soda pulp mills. New sources must meet the applicable PM emission limits proposed for new sources. The use of the bubble was limited to existing sources because (1) new sources historically have been held to stricter standards than existing sources, and (2) state-of-the-art equipment design and add-on controls can be integrated and installed most cost effectively during construction of new sources.

The PM emission limits are provided in units of g/dscm (gr/dscf) for kraft recovery furnaces and lime kilns and units of kg/Mg (lb/ton) of black liquor solids fired for SDT's to be consistent with the NSPS for kraft pulp mills. The PM HAP emission rates are provided in units of kg/Mg (lb/ton) of black liquor solids fired because of the low PM HAP concentrations present in exhaust gases from affected sources at kraft and soda pulp mills.

2. PM Standards for Sulfite Pulp Mills

In selecting the type and format of the proposed PM standard for sulfite pulp mills, the Agency took into consideration the limited amount of PM HAP data available for sulfite combustion units. Because very little PM HAP

data are available from sulfite combustion units, PM is used as a surrogate for PM HAP, and an alternate PM HAP standard is not provided. In addition, because (1) emissions from multiple sulfite combustion units at the same sulfite mill are typically controlled by the same equipment and (2) sulfite combustion units are the only affected source at sulfite mills, a "bubble" equation was not developed for sulfite pulp mills. The PM emission limits for both new and existing sulfite combustion units are based on available long-term PM emission data for sulfite combustion units in the State of Washington. The State of Washington data are expressed as PM concentrations [e.g., g/dscm (gr/dscf)], corrected to 8 percent oxygen. Therefore, the PM emission limits for new and existing sulfite combustion units are in concentration units, corrected to 8 percent oxygen.

3. Total Gaseous Organic HAP Standard for Kraft and Soda Pulp Mills

In selecting the type and format of the proposed total gaseous organic HAP standard for new kraft and soda NDCE recovery furnaces and DCE recovery furnace systems, the Agency considered the following facts: (1) methanol is the primary HAP for which emission data are available, (2) the emission mechanism for methanol is the same as for other gaseous organic HAP's, and (3) emissions of methanol from well-controlled sources are low (less than 5 ppm_v).

Consequently, the Agency elected to use methanol as a surrogate for total gaseous organic HAP's and establish a methanol emission limit in the form of a mass emission rate (i.e., kg/Mg [lb/ton] of black liquor solids fired).

4. Total Gaseous Organic HAP Standard for Stand-Alone Semichemical Pulp Mills

In selecting the type and format of the proposed total gaseous organic HAP standard for semichemical combustion sources, the Agency considered the following facts:

(1) approximately half of the affected sources at stand-alone semichemical pulp mills would require add-on controls to reduce HAP emissions, while the other half likely could meet the total gaseous organic HAP limit without add-on controls and/or could reduce HAP emissions through process changes, and (2) emissions from semichemical combustion units are highly variable. Therefore, the Agency elected to allow affected sources to meet either an emission limit (in units of kg/Mg [lb/ton] of black liquor solids fired) or a percent reduction to provide flexibility and to accommodate the expected differences in emission levels and control strategies at stand-alone semichemical pulp mills. The emission limit and percent reduction are both based on measurements of THC (measured as carbon) as a surrogate for total gaseous organic HAP's because THC data correlate with available HAP data.

I. Selection of Monitoring Requirements

To ensure compliance with today's proposed PM HAP standards, owners or operators of recovery furnaces and lime kilns equipped with ESP's would be required to maintain opacity levels below a specified level. Owners or operators of affected sources equipped with control devices other than ESP's would be required to establish control device or process operating parameter ranges that indicate the control device or process is being operated and maintained in accordance with good air pollution control practices. Owners or operators complying with the proposed total gaseous organic HAP limit for new kraft and soda recovery furnaces that use an NDCE recovery furnace with a dry ESP system are exempt from monitoring requirements for gaseous organic HAP's because the use of this equipment ensures continuous compliance with the emission limit.

Today's standards include two levels of monitoring. Each monitoring level specifies maximum opacities (ESP's only) and a maximum frequency with which the opacity or monitored parameters may exceed established levels. If the conditions of the first monitoring level are exceeded, the owner or operator would be required to implement the corrective actions contained in their SSM plan to bring the operating parameter or opacity levels back to established levels. Exceedance of the conditions of the second level

would constitute a violation of the standard. The purpose of the two-level monitoring approach is to prevent a violation from occurring by requiring the owner or operator to correct operating parameter or opacity excursions before the threat of a violation arises.

Owners or operators of kraft and soda SDT's and lime kilns and sulfite combustion units equipped with wet scrubbers would be required to establish a range of values for scrubber pressure drop and liquid flow rate that indicate compliance with today's PM HAP standards. The Agency selected the proposed monitoring parameters for wet scrubbers because these parameters are reliable indicators of PM and PM HAP control device performance.

For consistency with the NSPS for kraft pulp mills, the Agency adopted the following requirements from the NSPS: (1) the use of continuous opacity monitors to monitor PM emissions from ESP's; (2) the opacity level (i.e., 35 percent) indicating a violation of PM or PM HAP emission limits for existing kraft and soda recovery furnaces equipped with ESP's; and (3) the maximum allowable opacity exceedance frequency of 6 percent of the semiannual reporting period. For new kraft and soda recovery furnaces, a 6-minute average opacity level of 20 percent was selected as the opacity level that, if exceeded for 10 consecutive 6-minute periods, would require corrective action by the

owner or operator. An opacity level of 20 percent was chosen because the kraft recovery furnace that represents the new source MACT floor for PM control is subject to a State opacity limit of 20 percent.

Although the proposed PM emission limit for existing kraft and soda lime kilns is equivalent to the NSPS PM emission limit for gas-fired lime kilns, the monitoring requirement for determining compliance with the proposed PM emission limit is not equivalent to the NSPS monitoring requirement. The NSPS does not include an opacity limit for lime kilns. Under the proposed rule, the Agency selected 20 percent as the opacity level that, if exceeded for 10 consecutive 6-minute periods, would require corrective action by the owner or operator, and if exceeded for more than 6 percent of any semiannual reporting period, would constitute a violation of the standard. An opacity level of 20 percent was chosen because a number of newer existing lime kilns equipped with ESP's are currently subject to State opacity limits of 20 percent.

The Agency selected temperature as the operating parameter to be monitored and recorded for sources complying with the total gaseous organic HAP emission standard for semichemical combustion units through the use of an RTO because the temperature of the RTO is an indicator of total gaseous organic HAP control.

The Agency selected a 3-hour averaging time for calculating monitoring parameter values for the purpose of determining possible violations of the standard because (1) EPA test methods referenced in today's proposed rule require the owner or operator to perform a minimum of three 1-hour test runs, and (2) the limits of the established range of parameter values would be based on the average values obtained using all test data obtained during the performance test.

J. Selection of Test Methods

The following discussion identifies the test methods that are to be used for compliance determinations.

Test Method 5, "Determination of Particulate Emissions from Stationary Sources" [40 CFR part 60, appendix A]--in conjunction with either the integrated sampling techniques of Test Method 3, "Gas Analysis for the Determination of Dry Molecular Weight" [40 CFR part 60, appendix A] or Test Method 3A, "Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources" [40 CFR part 60, appendix A]--is the selected test method for determining compliance with the PM emission standards for kraft and soda recovery furnaces, SDT's, and lime kilns and sulfite combustion units. Test Method 5 was used to collect the PM emission data that form the basis of the PM standards proposed for kraft, soda, and sulfite combustion sources and

also is the required test method for measuring PM from sources subject to the NSPS for kraft pulp mills.

Test Method 17, "Determination of Particulate Matter Emissions from Stationary Sources (In-Stack Filtration Method)," may be used as an alternative to Test Method 5 if a constant value of 0.009 g/dscm (0.004 gr/dscf) is added to the results of Test Method 17 and the stack temperature is no greater than 205°C (400°F). Owners and operators of sources subject to the NSPS for kraft pulp mills are allowed to use Test Method 17 as an alternative to Test Method 5 for demonstrating compliance with the PM standards of the NSPS, and, therefore, today's proposed rule makes the same allowance to be consistent with the NSPS.

Test Method 29, "Determination of Metals Emissions from Stationary Sources" [40 CFR part 60, appendix A] is the selected test method for determining compliance with the PM HAP emission standards for kraft and soda recovery furnaces, SDT's, and lime kilns. Test Method 29 can also be used as an alternative to Test Method 5 for measuring PM emissions. The PM HAP data upon which the PM HAP emission limits for kraft and soda combustion sources are based were collected before Test Method 29 was proposed using a variety of test methods that are similar or identical to Test Method 29. Test Method 29 collects mercury in part with impingers filled with a solution of potassium permanganate. Because

manganese, a component of potassium permanganate, is also a target analyte for Test Method 29, extreme caution should be used to ensure that the potassium permanganate used to collect mercury does not contaminate the portions of the sample that will be analyzed for manganese. To eliminate the possibility of contamination, the Agency will allow operators or owners the option of measuring all of the target PM HAP's, except mercury, with Test Method 29 and making a separate measurement of the mercury using Test Method 101A, "Determination of Particulate and Gaseous Mercury Emissions from Sewage Sludge Incinerators" [40 CFR part 61, appendix A].

Test Method 308, "Procedure for Determination of Methanol Emissions from Stationary Sources" [40 CFR part 63, appendix A] is being promulgated today as part of the final NESHAP for noncombustion sources in the pulp and paper industry and is the test method for determining compliance with the total gaseous organic HAP emission limit for new kraft and soda NDCE recovery furnaces and any new DCE recovery furnace systems. The methanol data upon which the total gaseous organic HAP emission limit for new kraft and soda NDCE recovery furnaces and new DCE recovery furnace systems is based were collected using a test method developed by the National Council of the Paper Industry for Air and Stream Improvement that served as the basis for Test

Method 308. Performance testing using Test Method 308 (or any other approved test method for methanol emissions from kraft and soda recovery furnaces) would only be required for those new sources that choose to comply with total gaseous organic HAP emission limit for new kraft and soda recovery furnaces by using equipment other than an NDCE recovery furnace equipped with a dry ESP system.

Test Method 25A, "Determination of Total Gaseous Organic Concentration using a Flame Ionization Analyzer" [40 CFR part 60, appendix A] is the selected test method for determining compliance with the total gaseous organic HAP emission limit for semichemical combustion units. The THC data upon which the total gaseous organic HAP emission limit for semichemical combustion units is based were collected using Test Method 25A.

K. Selection of Reporting and Recordkeeping Requirements

The owner or operator of any kraft, soda, sulfite or stand-alone semichemical pulp mill subject to these standards would be required to fulfill the reporting and recordkeeping requirements outlined in § 63.10 of the General Provisions. These requirements include those associated with startup, shutdown, or malfunctions; operation and maintenance records; compliance monitoring system records; performance test data and reporting;

quarterly reports of no excess emissions; and quarterly reports of exceedances of the emission limits. The owner or operator of any kraft, soda, sulfite or stand-alone semichemical pulp mill subject to these standards would be required to submit quarterly reports of any exceedances of monitored operating parameter values required under the proposed rule. These quarterly reports must contain the monitored operating parameter value readings for the periods constituting exceedances and a description and timing of steps taken to address the cause of the exceedances.

L. Relationship to other Regulations

This section of the preamble discusses the interrelationship between today's proposed regulation and other federal regulations covering pulp mills. The purpose of this section is to document the Agency's evaluation of pertinent rules in an effort to minimize the burden on the industry and enforcement authorities. The Agency is interested in hearing from all interested parties on specific suggestions for reducing the overall burden of the rule without jeopardizing the enforceability of the rules or the Agency's overall emission reduction goals.

1. Noncombustion Source Rule and Chemical Recovery Combustion Source Rule

As mentioned previously in this notice (See section II-A, BACKGROUND), EPA is promulgating effluent limitations

guidelines and standards for the control of wastewater pollutants, as well as NESHAP for noncombustion sources in the pulp and paper industry as part of today's cluster rule. During the development of today's proposed chemical recovery combustion source NESHAP, the Agency examined both the chemical recovery combustion source rule and the noncombustion source rule to identify areas where the reporting and recordkeeping requirements of the rules could be minimized. Once the combustion source NESHAP has been promulgated, any of the initial notifications required by § 63.7(b) of subpart A can be combined for both NESHAP and a single notification submitted to the appropriate authority. However, some reporting and recordkeeping requirements are specific to the individual regulations because the rules cover different emission points at the pulp mill. To minimize the overall burden on the industry, the Agency made an effort to ensure that today's proposed NESHAP for chemical recovery combustion sources contains only the minimum amount of recordkeeping necessary to demonstrate compliance with the rule.

2. NSPS (Subpart BB of Part 60) and Chemical Recovery Combustion Source Rule

The NSPS for kraft pulp mills and the chemical recovery combustion source rule proposed today are closely related because both rules cover some of the same emission points.

As noted in section III.B of this preamble, today's proposed rule allows the use of PM as a surrogate for PM HAP. Both of the rules regulate PM emissions from recovery furnaces, lime kilns, and SDT's at kraft pulp mills. In addition, the proposed PM emission limits for existing kraft and soda recovery furnaces, SDT's and lime kilns are the same as the NSPS limits for kraft recovery furnaces, SDT's and gas-fired lime kilns. However, the proposed NESHAP regulates emissions from both new and existing affected sources, and, therefore, would regulate emissions from affected sources not currently impacted by the NSPS.

The PM emission limits in today's proposed rule for new and reconstructed affected sources at kraft pulp mills are more stringent than the NSPS PM limits. Also, today's proposed rule provides alternate PM HAP standards for existing affected sources. In addition, unlike the NSPS, today's proposed rule would allow owners or operators of existing kraft or soda pulp mills to meet an overall PM or overall PM HAP emission limit that includes all existing affected sources at the mill (i.e., the proposed bubble compliance alternative). However, owners or operators that choose to comply with the PM HAP standards of this proposed NESHAP by using the proposed bubble compliance alternative must continue to comply with the NSPS for kraft pulp mills by ensuring that existing affected sources subject to the

NSPS continue to meet the NSPS PM limits specified for those sources.

Today's proposed rule adopts many of the monitoring requirements in the NSPS. (See section III.D, Monitoring Requirements and Compliance Provisions.) Requirements adopted from the NSPS include those specifying the parameters to be monitored and frequency of monitoring, the level of opacity for existing recovery furnaces, and the required accuracy of monitoring equipment.

In addition to requirements adopted from the NSPS, today's proposed rule would require owners or operators of control systems other than ESP's to establish ranges of monitored parameters during initial compliance testing and to operate control systems within the established range. Today's proposed rule also sets intermediate opacity levels and frequencies of exceedances of established operating parameter ranges and opacity levels that would not indicate a violation of the standard but that would require the owner or operator to initiate the corrective actions identified in their SSM plan. Today's proposed rule also would require owners or operators of new recovery furnaces or new or existing lime kilns at kraft and soda pulp mills to monitor opacity levels and would specify a maximum opacity level of 20 percent rather than 35 percent, as is specified in the NSPS for kraft recovery furnaces.

The recordkeeping burden is different for the NSPS and today's proposed rule. Under the NSPS, the monitored values must be recorded once per shift. In today's proposed rule, the monitored values would be required to be recorded on a continuous basis, with the possible exception of when a source is controlled by a device or system other than an ESP, wet scrubber, or RTO. In such cases, the owner or operator would be required to obtain approval from the applicable permitting authority for a monitoring plan that proposes less frequent monitoring.

Another area where the two rules differ is the reporting requirements. For example, the General Provisions to part 60 (followed in the NSPS for kraft pulp mills) require only a 30-day prior notice before the performance test date; however the General Provisions to part 63 (i.e., the General Provisions for NESHAP) require notification 60 days prior to the performance test date. Unless stated otherwise, today's proposed rule follows the General Provisions to part 63.

3. New Source Review/Prevention of Significant Deterioration Applicability

The proposed level of gaseous organic HAP control for stand-alone semichemical combustion sources is based on the use of an RTO. The Agency expects that owners or operators of sources that cannot meet the total gaseous organic HAP

emission limit (as THC) without add-on controls would install an RTO to comply with the proposed NESHAP. However, as demonstrated during a pilot study, RTO's can generate NO_x emissions during normal operation. The emission increases of NO_x may be of such magnitude to trigger the need for preconstruction permits under the nonattainment new source review (NSR) or prevention of significant deterioration (PSD) program (hereinafter referred to as major NSR).

In a similar situation regarding the MACT standards for noncombustion sources in the pulp and paper industry that are being promulgated today as part of the pulp and paper industry cluster rule, industry and some States have commented extensively that in developing the proposed rule, EPA did not take into account the impacts that would be incurred in triggering major NSR. Commenters indicated that major NSR would: (1) cost the pulp and paper industry significantly more for permitting and implementation of additional SO₂ or NO_x controls than predicted by EPA; (2) impose a large permitting review burden on State air quality offices; and (3) present difficulties for mills to meet the proposed NESHAP compliance schedule of 3 years due to the time required to obtain a preconstruction permit. Industry commenters have stated that the pollution control project (PCP) exemption allowed under the current PSD policy provides inadequate relief from these potential impacts and

recommended including specific language in the proposed rule exempting MACT compliance projects from NSR/PSD.

In a July 1, 1994 guidance memorandum issued by the EPA (available on the TTN; see "Pollution Control Projects and New Source Review (NSR) Applicability" from John S. Seitz, Director, OAQPS, to EPA Regional Air Division Directors), the EPA provided guidance for permitting authorities on the approvability of PCP exclusions for source categories other than electric utilities. In the guidance, the EPA indicated that add-on controls and fuel switches to less polluting fuels qualify for an exclusion from major NSR. To be eligible to be excluded from otherwise applicable major NSR requirements, a PCP must, on balance, be "environmentally beneficial," and the permitting authority must ensure that the project will not cause or contribute to a violation of the national ambient air quality standards (NAAQS) or PSD increment, or adversely affect visibility or other air quality related values (AQRV) in a Class I area, and that offsetting reductions are secured in the case of a project which would result in a significant increase of a nonattainment pollutant. The permitting authority can make these determinations outside of the major NSR process. The 1994 guidance did not void or create an exclusion from any applicable minor source preconstruction review requirements in an approved State Implementation Plan (SIP). Any minor

NSR permitting requirements in a SIP would continue to apply, regardless of any exclusion from major NSR that might be approved for a source under the PCP exclusion policy.

In the July 1, 1994 guidance memorandum, the EPA specifically identified the RTO as an example of an add-on control that could be considered a PCP and an appropriate candidate for a case-by-case exclusion from major NSR. For the purposes of today's proposed standards for chemical recovery combustion sources at stand-alone semichemical pulp mills, the EPA considers the application of the RTO to reduce total gaseous organic HAP emissions to be a PCP because the RTO is an add-on control device that would be installed specifically to comply with MACT and will reduce emissions of hazardous organic air pollutants. Furthermore, EPA considers the installation of the RTO to be environmentally beneficial because it would significantly reduce emissions of VOC's and CO as well as the emissions of the targeted pollutants (total gaseous organic HAP's). However, EPA recognizes that incidental formation of NO_x will occur during operation of the RTO. Consistent with the 1994 guidance, the permitting authority should confirm that, in each case, the resultant increase in NO_x emissions would not cause or contribute to a violation of a NAAQS, PSD increment, or adversely affect an AQRV.

The EPA believes that the current guidance on pollution control projects adequately provides for the exclusion from major NSR of air pollution control projects in the pulp and paper industry resulting from today's proposed rule. Such projects would be covered under minor source regulations in the applicable SIP, and permitting authorities would be expected to provide adequate safeguards against NAAQS and increment violations and adverse impacts on AQRV in Federal Class I areas. Only in those areas where potential adverse impacts cannot be resolved through the minor NSR programs or other mechanisms would major NSR apply.

The EPA recognizes that, where there is a potential for an adverse impact, some small percentage of mills located near Class I PSD areas might be subject to major NSR, i.e., the permitting authority determines that the impact or potential impact cannot be adequately addressed by its minor NSR program or other SIP measures. If this occurs, there is a question whether MACT and NSR compliance can both be done within the respective rule deadlines. Although too speculative to warrant disposition in this rule, EPA is alert to this potential problem and will attempt to create implementation flexibility on a case-by-case basis should a problem actually occur.

M. Solicitation of Comments

The EPA seeks full public participation in arriving at its final decisions and encourages comments on all aspects of this proposal from all interested parties. Full supporting data and detailed analyses should be submitted with comments to allow EPA to make maximum use of the comments. All comments should be directed to the Air and Radiation Docket and Information Center, Docket No. A-94-67 (see ADDRESSES). Comments on this notice must be submitted on or before the date specified in the "DATES" section.

Commentors wishing to submit proprietary information for consideration should clearly distinguish such information from other comments and clearly label it "Confidential Business Information" (CBI). Submissions containing such proprietary information should be sent directly to the Emission Standards Division CBI Office, U. S. Environmental Protection Agency (MD-13), Research Triangle Park, North Carolina 27711, with a copy of the cover letter directed to Mr. Jeff Telander of the Minerals and Inorganic Chemicals Group (see the "FOR FURTHER INFORMATION CONTACT" section for the address). Confidential business information should not be sent to the public docket. Information covered by such a claim of confidentiality will be disclosed by EPA only to the extent allowed and by the procedures set forth in 40 CFR part 2.

If no claim of confidentiality accompanies the submission when it is received by EPA, it may be made available to the public without further notice to the commentor.

V. Impacts of Proposed Standards

A. Number of Impacted Sources

An estimated 211 recovery furnaces, 227 SDT's, and 192 lime kilns currently operate at kraft and soda pulp mills in the United States and would be affected by today's proposed standards. The EPA estimates that 52 of the recovery furnaces, 56 of the SDT's, and 77 of the lime kilns would be required to upgrade or replace add-on controls to reduce emissions of PM HAP's under the proposed standards. (These estimates and the impacts estimates in the following sections were determined based on control of PM or PM HAP emissions without using the proposed bubble compliance alternative.)

An estimated 21 sulfite combustion units and 14 semichemical combustion units currently operate in the United States and would be affected by today's proposed standards. Under the proposed standards, an estimated eight sulfite combustion units would be required to upgrade or replace add-on controls to reduce emissions of PM HAP's; an estimated seven semichemical combustion units would be required to add controls to reduce emissions of total gaseous organic HAP's.

B. Environmental Impacts

Nationwide HAP emissions from combustion sources at pulp mills are estimated to be 32,400 Mg/yr (35,700 tons/yr) at the current level of control. The proposed standards are estimated to reduce total HAP emissions by about 2,600 Mg/yr (2,800 tons/yr). In addition to the HAP reductions, the proposed standards would result in the reduction of criteria air pollutants, such as PM and VOC. After implementation of the proposed standards, PM emissions from combustion sources at pulp mills are estimated to decrease by about 23,800 Mg/yr (26,200 tons/yr) from a baseline level of 64,400 Mg/yr (71,000 tons/yr); VOC emissions from combustion sources at stand-alone semichemical pulp mills are estimated to decrease by about 32,600 Mg/yr (35,900 tons/yr) from a baseline level of 36,600 Mg/yr (40,300 tons/yr); carbon monoxide (CO) emissions from combustion sources at stand-alone semichemical pulp mills are estimated to decrease by about 57,700 Mg/yr (63,600 tons/yr) from a baseline level of 62,800 Mg/yr (69,200 tons/yr); and emissions of nitrogen oxides (NO_x) from combustion sources at stand-alone semichemical pulp mills are estimated to increase by about 476 Mg/yr (525 tons/yr) from a baseline level of 278 Mg/yr (306 tons/yr).

The quantity of PM collected will increase when recovery furnace PM control devices are upgraded or replaced

to comply with the proposed standards. However, no increases in solid waste disposal are expected because existing mills have sufficient capacity within the chemical recovery process to recycle the additional PM collected.

If owners or operators choose to replace wet scrubbers with ESP's to comply with the proposed PM HAP standards for lime kilns, the generation of wastewater will be reduced. The significance of the reduction in wastewater will depend on whether the scrubber discharge had previously been recycled and reused. If wet scrubbers are replaced by ESP's (and there was no prior recycle or reuse of scrubber discharge), EPA estimates that wastewater discharge will decrease nationwide by about 36 billion liters per year (L/yr) (9.5 billion gallons per year [gal/yr]) following implementation of the proposed standards.

C. Energy Impacts

The overall energy demand (i.e., electricity plus natural gas) is expected to decrease by about 46.7 million megajoules per year (MJ/yr) (44.3 billion British thermal units per year [Btu/yr]) nationwide under the proposed standards. Electricity requirements are expected to decrease by about 17,200 megawatt-hours per year (MWh/yr) under the proposed standard. This net decrease in electricity requirements includes (1) an expected increase of about 41,400 MWh/yr when PM control devices on kraft and

soda recovery furnaces and SDT's and sulfite combustion units are upgraded or replaced, (2) an expected increase of 18,900 MWh/yr when total gaseous organic HAP control devices are added to semichemical combustion units, and (3) an expected decrease of about 77,500 MWh/yr if wet scrubbers are replaced by ESP's to provide increased control of PM emissions from lime kilns. Natural gas requirements are expected to increase by about 0.4 million cubic meters per year (m³/yr) (14 million cubic feet per year [ft³/yr]) when total gaseous organic HAP controls are added to semichemical combustion units.

D. Cost Impacts

The estimated capital costs of control for the proposed standards are \$258 million. The capital costs of the proposed standards include the costs to purchase and install both the control equipment and monitoring equipment. Most (85 percent) of the capital costs can be attributed to PM controls for kraft and soda combustion sources (recovery furnaces, lime kilns, and SDT's). The kraft and soda PM control costs are estimated based on ESP upgrades for recovery furnaces, replacement of existing wet scrubbers with ESP's for lime kilns, and replacement of existing wet scrubbers with new wet scrubbers for SDT's. The proposed bubble compliance alternative was not considered in

estimating the capital PM control costs, and, therefore, the capital costs may be overstated.

The incremental annual costs of the proposed standards are \$35.2 million/yr. The annualized costs account for the year-to-year operating expenses associated with the control equipment and the monitoring equipment, in addition to the capital recovery expense associated with the equipment purchases. Most (81 percent) of the annual costs can be attributed to the PM controls for kraft and soda recovery furnaces and SDT's. The annual costs for lime kiln PM controls are cost savings, based on the lower operating costs for ESP's compared to wet scrubbers. The proposed bubble compliance alternative was not considered in estimating the annual PM control costs, and, therefore, the annual costs may be overstated. The total average costs for annual recordkeeping and reporting required by the proposed standards are \$6.8 million/yr over the first 3 years after implementation of the standards.

E. Economic Impact

The economic impacts of today's proposed NESHAP (i.e., MACT II) and the NESHAP for noncombustion sources (i.e., MACT I and II) and effluent limitations guidelines being promulgated today are collectively discussed in section VIII of the integrated preamble for "NESHAP for Source Category: Pulp and Paper Production; Effluent Limitations Guidelines,

Pretreatment Standards, and New Source Performance Standards: Pulp, Paper, and Paperboard Category," hereafter referred to as the integrated preamble.

F. Benefits Analysis

Implementation of the proposed regulation is expected to reduce emissions of HAP's, PM, VOC, SO₂, and CO, while it is expected to slightly increase emissions of NO_x. The air quality benefits expected to result from the above emission reductions will be a decrease in adverse health effects associated with inhalation of the above pollutants as well as improved welfare effects, such as improved visibility and crop yields. The benefits analysis is able to quantify and monetize the health and welfare benefits associated with some of these emission reductions. Total monetized benefits of the proposed regulatory alternative for VOC, PM, and SO₂ emission reductions range from approximately \$302 million to \$384 million. (Refer to the integrated preamble, and the Economic Analysis Document for a detailed description of the methodology used to monetize the benefits.)

Benefit categories that are monetized were compared to annualized control costs of the regulatory alternatives to determine net benefits. In general, the regulatory alternative with the greatest net benefits is optimal from an efficiency standpoint and will be the most beneficial to society. Net benefits of the proposed regulatory

alternative (\$270 million to \$352 million) are greater than the net benefits of all other regulatory alternatives, except those that combine the most stringent control options for kraft and soda mills. However, economic impact and distributional issues must be considered in conjunction with the cost-benefit analysis in the choice of proposed regulatory alternative.

The control costs of the MACT II regulation increase significantly between regulatory options one and four for kraft and soda mills (see section IV.F of this notice). Capital costs increase approximately 850 percent and annualized costs 560 percent when comparing the costs of option one versus four for kraft and soda mills. The estimated increase in the price of unbleached kraft pulp that will result from the MACT II rule differs greatly under the different regulatory options as well. Specifically, prices for unbleached kraft pulp are estimated to increase from 1.4 percent with the least stringent option to 7.4 percent with the more stringent regulatory option for kraft and soda mills.

Based on the economic impact analysis conducted, the increased emission control costs associated with the most stringent kraft and soda MACT II option are predicted to result in one or more company bankruptcies in the pulp and paper industry. Although the EPA can not determine with

certainty the economic costs associated if one or more large firms experience bankruptcy, the EPA has reason to believe that these impacts would likely be significant. Economic impacts and distributional effects associated with bankruptcies may include issues involving changes in the ownership of the firm, loss in investment values for existing investors in the firm, potentially higher financing costs, possible mill closures, and probable job losses. These factors were not directly considered in the cost-benefit analysis conducted for the regulation.

While the cost-benefit analysis seems to indicate that the net benefits of the most stringent regulatory alternative exceed the net benefits of the proposed alternative, the economic impact and distributional effects associated with the most stringent option for kraft and soda mills have not been considered directly in this analysis. These economic impact and distributional issues lead to the conclusion that the regulatory alternatives involving the most stringent option for kraft and soda mills are less than optimal.

VI. Administrative Requirements

A. Docket

The docket is an organized and complete file of all information considered by EPA in developing this proposed rule. The principal purposes of the docket are (1) to allow

interested parties to readily identify and locate documents so that they can effectively participate in the rulemaking process, and (2) to serve as the record in case of judicial review. (See section 307(d)(7)(A) of the CAA).

B. Public Hearing

A public hearing will be held, if requested, to discuss the proposed standards in accordance with section 307(d)(5) of the Act. Persons wishing to make oral presentations on the proposed standards should contact the EPA (see DATES for contact person and address). If a public hearing is requested and held, EPA will ask clarifying questions during the oral presentation but will not respond to the presentation of comments. To provide an opportunity for all who wish to speak, oral presentations will be limited to 15 minutes each. Any member of the public may file a written statement on or before [insert date 60 days from FR publication]. Written statements should be addressed to the Air and Radiation Docket and Information Center (see ADDRESSES) and refer to Docket No. A-94-67. Written statements and supporting information will be considered with equivalent weight as any oral statement and supporting information subsequently presented at a public hearing, if held. A verbatim transcript of the hearing and written statements will be placed in the docket and will be available for public inspection and copying, or will be

mailed upon request, at the Air and Radiation Docket and Information Center (see ADDRESSES).

C. Executive Order 12866

Under Executive Order 12866 (58 FR 51736, October 4, 1993), the Agency must determine whether the regulatory action is "significant" and, therefore, subject to review by the Office of Management and Budget (OMB) and the requirements of the Executive Order. The Executive Order defines "significant regulatory action" as one that is likely to result in a rule that may:

1. Have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or Tribal governments or communities;
2. Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
3. Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, OMB has notified EPA that this action is a "significant regulatory

action" within the meaning of the Executive Order. For that reason, this action was submitted to OMB for review. The regulatory impact assessment (RIA) is detailed in the Economic Analysis Document (docket entry No. II-A-32). Changes made in response to OMB suggestions or recommendations will be documented in the public record.

D. Enhancing the Interdepartmental Partnership Under Executive Order 12875

In compliance with Executive Order 12875, the Agency has involved State regulatory experts in the development of this proposed rule. No Tribal governments are believed to be affected by this proposed rule. State and local governments are not directly impacted by the rule, i.e., they are not required to purchase control systems to meet the requirements of the rule. However, they will be required to implement the rule; e.g., incorporate the rule into permits and enforce the rule. They will collect permit fees that will be used to offset the resources burden of implementing the rule. Comments have been solicited from States and have been carefully considered in the rule development process. In addition, all States are encouraged to comment on this proposed rule during the public comment period, and the EPA intends to fully consider these comments in the development of the final rule.

E. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), P.L. 104-4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that may result in expenditures to State, local, and tribal governments, in the aggregate, or to the private sector, of \$100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including tribal governments, it must have developed under

section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant Federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

The EPA has determined that this rule contains a Federal mandate that may result in expenditures of \$100 million or more for State, local, and Tribal governments, in the aggregate, or the private sector in any one year. Accordingly, EPA has prepared under section 202 of the UMRA a written statement which is summarized below.

1. Statutory Authority

As discussed in section I of this preamble, the statutory authority for this rulemaking is section 112 of the CAA. Title III of the CAA Amendments was enacted to reduce the amount of nationwide air toxic emissions. Section 112(b) lists the 189 chemicals, compounds, or groups of chemicals deemed by Congress to be HAP's. These toxic air pollutants are to be regulated by NESHAP. Hazardous air pollutant emissions from the pulp and paper production source category are being regulated under section 112(d) of the CAA. The NESHAP requires existing and new major sources

to control emissions of HAP's using the maximum achievable control technology (MACT).

The pulp and paper production source category includes all mills that produce pulp and/or paper. The NESHAP for the source category are being developed in phases. This proposed NESHAP, referred to as MACT II, regulates chemical recovery combustion sources at kraft, soda, sulfite, and stand-alone semichemical pulp mills. The final NESHAP for noncombustion sources regulates noncombustion processes at mills that (1) chemically pulp wood fiber (using kraft, sulfite, soda, and semi-chemical methods) (MACT I), and (2) mechanically pulp wood fiber (e.g., groundwood, thermomechanical, pressurized), pulp secondary fibers (deinked and nondeinked), and pulp nonwood (MACT III).

Compliance with section 205(a): Regarding the EPA's compliance with section 205(a), the EPA did identify and consider a reasonable number of alternatives; a summary of these alternatives is provided in section IV.F of this preamble. Additional information on the costs and environmental impacts of the regulatory alternatives is presented in the Nationwide Costs, Environmental Impacts, and Cost-Effectiveness of Regulatory Alternatives for Kraft, Soda, Sulfite, and Semichemical Combustion Sources Memo (docket entry No. II-B-63).

The chosen alternative represents the MACT floor for chemical recovery combustion sources at kraft, soda and sulfite pulp mills and is the least costly and least burdensome alternative for those sources. The chosen alternative also includes an option more stringent than the MACT floor for chemical recovery combustion sources at semichemical pulp mills. However, the EPA considers the cost-effectiveness of the more stringent option for semichemical chemical recovery combustion sources (less than \$2,800/Mg HAP's, based on conservative cost estimates) acceptable, especially when measured against the environmental benefits of reducing emissions of both HAP's and non-HAP's. Therefore, the EPA concludes that the chosen alternative is the least costly and least burdensome alternative that achieves the objectives of section 112, as called for in section 205(a).

2. Social Costs and Benefits

The regulatory impact analysis prepared for the proposed NESHAP for MACT I, including the Agency's assessment of costs and environmental benefits, is detailed in the "Regulatory Impact Assessment of Proposed Effluent Guidelines and NESHAP for the Pulp, Paper, and Paperboard Industry," (EPA 821-R93-020). The regulatory impact assessment document has been updated for the final rule for MACT I and III and the proposed rule for MACT II and is

referred to as the Economic Analysis Document (docket entry No. II-A-32). Social costs and benefits also are discussed in section V of this preamble.

3. Future and Disproportionate Costs

The Unfunded Mandates Act requires that EPA estimate, where accurate estimation is reasonably feasible, future compliance costs imposed by the rule and any disproportionate budgetary effects. The EPA's estimates of the future compliance costs of this rule are discussed in section V.D of this preamble.

The EPA does not believe that there will be any disproportionate budgetary effects of the rule on any particular areas of the country, particular governments or types of communities (e.g., urban, rural), or particular industry segments.

4. Effects on the National Economy

The Unfunded Mandates Act requires that EPA estimate the effect of this rule on the national economy. To the extent feasible, EPA must estimate the effect on productivity, economic growth, full employment, creation of productive jobs, and international competitiveness of the U.S. goods and services, if and to the extent that the EPA in its sole discretion determines that accurate estimates are reasonably feasible and that such effect is relevant and material.

Estimates of the impact of this rule on the national economy are described in section VIII of the integrated preamble to the final rule for MACT I and III and the effluent guidelines that are being promulgated today. The nationwide economic impact of the rule is based on the Economic Analysis Document (docket entry No. II-A-32).

5. Consultation with Government Officials

The Unfunded Mandates Act requires that EPA describe the extent of the agency's prior consultation with affected State, local, and tribal officials, summarize the officials' comments or concerns, and summarize EPA's response to those comments or concerns. In addition, section 203 of the Act requires that EPA develop a plan for informing and advising small governments that may be significantly or uniquely impacted by a proposal. Although this rule does not affect any State, local, or Tribal governments, EPA has consulted with State and local air pollution control officials. The Agency also has held numerous meetings on these proposed integrated rules with many of the stakeholders from the pulp and paper industry, including the American Forest and Paper Association (AF&PA), the National Council of the Paper Industry for Air and Stream Improvement (NCASI), numerous individual companies, environmental groups, consultants and vendors, labor unions, and other interested parties. The

EPA has added materials to the Air and Water docket to document these meetings.

F. Regulatory Flexibility

The Regulatory Flexibility Act (RFA)(5 U.S.C. 601 et seq., Pub. L. 96-354), amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), requires the Agency to examine the potential economic impact of regulatory action on small entities. The Agency has recently established guidelines to help analysts comply with RFA requirements, and to determine if a substantial number of small businesses are significantly impacted. The Agency has estimated the economic impact of the integrated regulatory alternative on small companies involved in pulp, paper, and paperboard manufacturing, and these impacts are discussed in the integrated preamble to the final rule for MACT I and III and the effluent limitations guidelines being promulgated today and in the Economic Analysis Document (docket entry No. II-A-32). As explained there, the CAA rule does not have a significant economic impact on a substantial number of small entities, within the meaning of section 605(b) of the Regulatory Flexibility Act. In making this finding, the Agency explicitly considered the potential impacts of this proposal in combination with both the final CAA rules, and also the final CWA rule. The EPA adopts the same analysis here, and, thus, certifies that this proposed

rule does not have a significant impact on a substantial number of small entities.

G. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to OMB under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. An Information Collection Request (ICR) document has been prepared by EPA (ICR No. 1805.01), and a copy may be obtained from Sandy Farmer, OPPE Regulatory Information Division (2136); U. S. Environmental Protection Agency (2136); 401 M Street SW.; Washington, D.C. 20460, or by calling (202) 260-2740. The public reporting and recordkeeping burden for this collection of information is estimated to average 1,350 hours per affected pulp mill annually over the first 3 years after implementation of the standards. This includes time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Director, OPPE Regulatory Information Division (2136), U. S. Environmental Protection Agency, 401 M Street SW., Washington, D.C. 20460; and to the Office of Information and Regulatory Affairs,

Office of Management and Budget, Washington, D.C. 20503, marked "Attention: Desk Officer for EPA." The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

H. Clean Air Act

In accordance with section 117 of the Act, publication of this proposal was preceded by consultation with appropriate advisory committees, independent experts, and Federal departments and agencies. Pursuant to section 112(f), this regulation will be reviewed 8 years from the date of promulgation. This review will include an assessment of such factors as evaluation of the residual health risks, any overlap with other programs, the existence of alternative methods, enforceability, improvements in emission control technology and health data, and reporting and recordkeeping requirements.

List of Subject in 40 CFR Part 63

Air pollution control, Hazardous air pollutants, Pulp and paper mills, Reporting and recordkeeping requirements.

Date

Carol M. Browner, Administrator