OFFICE OF INSPECTOR GENERAL

Catalyst for Improving the Environment

Evaluation Report

Improvements in Air Toxics Emissions Data Needed to Conduct Residual Risk Assessments

Report No. 08-P-0020

October 31, 2007

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Abbreviations

AFS	Air Facility Subsystem
CAA	Clean Air Act
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
ECMC	Emission Calculation Method Code
EPA	U.S. Environmental Protection Agency
GACT	Generally Available Control Technology
GAO	Government Accountability Office
HAP	Hazardous Air Pollutant
IDEA	Integrated Data for Enforcement Analysis
LDAR	Leak Detection and Repair
MACT	Maximum Achievable Control Technology
NEI	National Emissions Inventory
NESHAP	National Emission Standards for Hazardous Air Pollutants
OAQPS	Office of Air Quality Planning and Standards
OECA	Office of Enforcement and Compliance Assurance
OIG	Office of Inspector General
PAH	Polycyclic Aromatic Hydrocarbon
POM	Polycyclic Organic Matter
TRI	Toxics Release Inventory
VOC	Volatile Organic Compound

Cover photos: Industries that represent the three MACT sources categories on which our review concentrated are shown. These include, clockwise from top left: an aluminum plant, a petroleum refinery, and a paper mill. (All photos courtesy U.S. Department of Energy)

U.S. Environmental Protection Agency
Office of Inspector General

08-P-0020
October 31, 2007

At a Glance

Catalyst for Improving the Environment

Why We Did This Review

The 1990 Clean Air Act Amendments required the U.S. Environmental Protection Agency (EPA) to develop maximum achievable control technology (MACT) standards to reduce air toxics emissions from stationary sources. In 2004, EPA completed the last of its MACT standards. We conducted this evaluation to assess the effectiveness of those standards in reducing air toxics emissions.

Background

EPA has issued 96 MACT standards covering 174 different categories of industrial sources of air toxics. Now that the MACT standards have been issued, EPA must assess the public health risk remaining after each MACT standard is implemented. If the risk from a MACT category is "unacceptable," EPA must promulgate additional regulations to reduce air toxics emissions from that category. Excess exposure to air toxics can increase one's risk of developing cancer and other serious ailments.

For further information, contact our Office of Congressional and Public Liaison at (202) 566-2391.

To view the full report, click on the following link:
www.epa.gov/oig/reports/2008/20071031-08-P-0020.pdf

Improvements in Air Toxics Emissions Data Needed to Conduct Residual Risk Assessments

What We Found

EPA's National Emissions Inventory (NEI) data indicate an overall decline in air toxic emissions concurrent with implementation of the MACT standards. Although NEI data reliability is uncertain, it is reasonable to conclude that air toxics emissions have decreased. Our work suggests that the MACT program has played a role in these reductions.

EPA plans to use NEI data to assess the public health risk remaining from MACT sources' air toxics emissions, but the reliability of NEI data for site-specific emissions varies considerably. EPA has not established objectives to define an acceptable level of quality for NEI data used in the residual risk process. EPA guidance recommends that program offices develop data quality objectives for using data in such decision-making processes. Given the uncertainties associated with NEI data, EPA could over- or under-estimate public health risk from MACT sources' emissions. Overstating risk could result in EPA placing on industries regulations that are not cost beneficial. Conversely, understating risk could result in EPA not requiring regulations where needed to protect public health.

In our March 2004 report on EPA's air toxics performance measures, we recommended that EPA require State reporting of air toxics emissions data. EPA has not implemented this recommendation, citing unclear statutory authority and the belief that voluntary reporting can achieve this goal. However, such a requirement could help EPA obtain more reliable and complete NEI data.

In December 2006, EPA presented its plan for conducting residual risk assessments to EPA's Science Advisory Board. The Board's June 2007 report recommended several actions to improve this process. These recommendations included developing a framework for improving the NEI data and conducting an analysis to determine the impact of data uncertainty on the risk assessments. In March 2007, EPA solicited public comment on the NEI and other data it plans to use for conducting residual risk assessments.

What We Recommend

We recommend that EPA develop data quality objectives for using NEI data in conducting residual risk assessments, and establish requirements for State reporting of air toxics emissions data and compliance monitoring information. EPA disagreed with our recommendations, but stated that it had activities underway to improve the NEI data. However, EPA's planned actions do not sufficiently address the problems identified, and we consider the issues unresolved.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

October 31, 2007

MEMORANDUM

SUBJECT: Improvements in Air Toxics Emissions Data Needed to Conduct Residual Risk Assessments
Report No. 08-P-0020

FROM: Wade T. Najjum
Assistant Inspector General for Program Evaluation

TO: Robert J. Meyers
Principal Deputy Assistant Administrator for Air and Radiation

This is our report on the subject evaluation conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). This report contains findings that describe the problems the OIG has identified and the corrective actions the OIG recommends. This report represents the opinion of the OIG and does not necessarily represent the final EPA position. Final determinations on matters in this report will be made by EPA managers in accordance with established audit resolution procedures.

The estimated cost of this report – calculated by multiplying the project's staff days by the applicable daily full cost billing rates in effect at the time – is $1,288,566.

Action Required

In accordance with EPA Manual 2750, you are required to provide a written response to this report within 90 calendar days. You should include a corrective action plan for agreed upon action, including milestones. This report will be available at http://www.epa.gov/oig.

If you or your staff have any questions regarding this report, please contact me at (202) 566-0827 or najjum.wade@epa.gov; or Rick Beusse, Product Line Director, at (919) 541-5747 or beusse.rick@epa.gov.

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Chapter 1
Introduction

Purpose

The 1990 Amendments to the Clean Air Act (CAA) required the U.S. Environmental Protection Agency (EPA) to develop and issue maximum achievable control technology (MACT) standards to reduce emissions of air toxics from certain categories of stationary sources. EPA issued the last of its MACT standards in 2004. EPA anticipates that when fully implemented in 2007, MACT standards will reduce air toxics emissions from stationary sources by 1.7 million tons per year. We conducted this evaluation to assess the progress of MACT standards in reducing air toxics emissions. Specifically, we sought to determine:

1. To what extent MACT standards have reduced emissions of air toxics and achieved the emission reductions anticipated when the rules were developed?

2. What factors are associated with the effectiveness of MACT standards in achieving emission reductions, including:

   - What factors external to MACT standards have impacted changes in emissions?
   - Is there a relationship between the quantity and quality of compliance monitoring and enforcement and the effectiveness of MACT standards in achieving the desired emissions reductions?
   - Is there a relationship between the adequacy of compliance assistance tools and the effectiveness of MACT standards in achieving the desired emissions reductions?

Background

Toxic air pollutants are those pollutants known or suspected to cause cancer or other serious health effects. The 1990 CAA Amendments established a list of 189 air toxics that EPA is required to control. Since 1990, EPA has revised the list slightly and currently regulates 187 air toxics. These pollutants are also referred to as hazardous air pollutants (HAPs). Congress selected these toxic air pollutants on the basis of potential health and/or environmental hazard.

EPA's latest National Air Toxics Assessment estimated that in 1999 more than 270 million people lived in U.S. census tracts where the combined upper bound lifetime cancer risk from air toxics exceeded 10 in 1,000,000. People who live near certain major industrial plants may face even higher cancer risks from air toxics. The following table shows the sources of air toxics emissions:

Table 1.1: Sources of Air Toxics Emissions

Source	Description
Large Stationary or Major	Any building, structure, facility, or installation that emits or may emit any air pollutant. Large or major stationary sources are those that emit 10 tons or more per year of any of the listed toxic air pollutants, or 25 tons or more per year of a combination of air toxics.
Area	Stationary sources that emit less than 10 tons per year of a single air toxic, or less than 25 tons per year of a combination of air toxics. While emissions from individual area sources are often relatively small, collectively their emissions can be of concern, particularly where large numbers of sources are located in heavily populated areas.
Mobile	Includes cars and light trucks, heavy trucks and buses, nonroad recreational vehicles (such as dirt bikes and snowmobiles), farm and construction machines, lawn and garden equipment, marine engines, aircraft, and locomotives.

Source: Developed by Office of Inspector General (OIG) staff based on information from EPA

According to the most recent National Air Toxics Assessment, major stationary sources, which are the principal sources regulated by the MACT program, account for approximately 11 percent of the average national cancer risk from exposure to air toxics. Examples of toxic air pollutants include benzene, which is emitted from petroleum refineries and other sources; hydrogen fluoride, which is emitted from primary aluminum facilities and other sources; and formaldehyde,[1] which is emitted from pulp and paper mills as well as petroleum refineries and other sources.

MACT Is First of Two Phases to Reduce Air Toxics Risks

To control air toxics emissions from major stationary sources, the CAA requires a two-phased approach. The first phase requires EPA to develop emission standards, referred to as MACT standards, for sources that emit the air toxics identified in the CAA. To identify those sources requiring emission standards, the CAA requires EPA to list the categories of major and area stationary sources of air toxics emissions. In 1992, EPA published the initial list of air toxics source categories requiring emissions standards. This list included both major and area source categories, but the majority were major source categories.[2] Based on that initial list and subsequent revisions, EPA has promulgated 96 MACT standards covering 174 different source categories. The second phase is commonly referred to as the residual risk and technology review program. This phase requires EPA to assess the public health risk remaining after implementation of the MACT

[1] EPA staff informed us that in the last 3-4 years the toxicity risk for formaldehyde has been lowered, and is no longer considered a key HAP. However, controversy remains over this action.

[2] EPA has identified additional categories of area sources that present health risks in urban areas, as required by the CAA, that were not included in this initial list. On November 22, 2002, EPA issued the final list of 70 source categories for regulation under the area source program as required under CAA sections 112(c)(3) and 112(k)(3)(B)(ii). EPA is under court order to complete regulations for these area source categories.

standards for both major and area sources.[3] This second phase also requires that EPA review the technology-basis of the major and area source standards for advancement in technology and develop additional standards if needed. Table 1.2 describes the two phases and their implementation status as of August 2007.

Table 1.2: Two Phases for Reducing Air Toxics Emissions and Risks from Stationary Sources

Description		Status
Phase 1	EPA was required to set technology-based MACT standards for major sources of air toxics. These standards were to reflect, at a minimum, the level of emissions that the best performing 12 percent of sources in the category were achieving in practice. EPA was also required to set technology-based standards for area sources. These could be either MACT (setting standards as least as stringent as the best performing 12 percent) or could be based on generally available control technology (GACT).	EPA promulgated the last of its 96 MACT standards in September 2004. EPA promulgated 27 GACT standards as of July 2007
Phase 2	EPA must promulgate stricter standards if the original MACT standard is not sufficiently protective of human health. These standards are referred to as residual risk standards, since they address the remaining or residual risk after implementation of the original MACT. Section 112 requires these stricter standards if the MACT standard has not reduced excess lifetime cancer risk to the most exposed individual to less than one in 1,000,000. The CAA requires that EPA establish these standards within 8 years after promulgation of the MACT. In addition, section 112 requires EPA to review, and if necessary, revise both MACT and GACT standards for both major and area sources considering advancements in control technologies. The CAA requires that EPA conduct these technology reviews every 8 years after promulgation of the MACT/GACT standards.	Ongoing. As of June 2007, EPA had completed eight residual risk and technology review standards and had proposed risk and technology review standards for petroleum refining in September 2007. EPA has begun a new streamlined process for developing standards, called Risk and Technology Review. EPA expects to propose six additional standards by the end of the calendar year

Source: Developed by OIG staff based on information from EPA

MACT standards generally establish emission limits for the air toxics of concern emitted from the covered sources. These limits are based on the emission reductions achieved by the highest performing sources in that source category. However, not all MACT standards include emission limits. The MACT standards for different source categories can vary greatly in the number and complexity of requirements. Regardless of the standard's specific requirements, each MACT has an effective date of compliance by which all covered facilities must comply

[3] These residual risk assessments are not required where EPA set a generally available control technology standard instead of a MACT standard for area sources, as provided by CAA section 112(d)(5).

with the MACT's requirements. By the end of 2007, all 96 MACT standards would have reached their effective date of compliance.[4]

Eight years after each MACT standard is promulgated, EPA is required to assess the public health risks remaining from that source category's air toxics emissions. The CAA stipulates that EPA must consider the excess lifetime cancer risks to the individual most exposed to HAP emissions from a facility in a specific source category. If, after implementation, EPA finds that a MACT standard is not sufficiently protective of health, the Agency must issue additional standards that provide an "ample margin of safety" to protect public health.

EPA's approach to determine whether a MACT standard is sufficiently protective of health considers risk and other factors. A lifetime cancer risk of greater than 1 in 1,000,000 is considered a trigger point requiring more detailed analysis to determine whether additional reductions are required to provide an "ample margin of safety." EPA considers cost, technical feasibility, and other factors in deciding whether a risk greater than 1 in 1,000,000 provides an ample margin of safety. However, a risk greater than 1 in 10,000 is generally considered as not providing an ample margin of safety and would require EPA actions to reduce that risk. Table 1.3 shows EPA's decision approach to conducting residual risk assessments:

Table 1.3: Decision Making Process for Residual Risk

Maximum Individual Risk = 1 in 1,000,000 or Less	Maximum Individual Risk = Between 1 in 1,000,000 and 1 in 10,000	Maximum Individual Risk = 1 in 10,000 or Greater
"Ample margin of safety" is met. No additional action is needed.	Costs, technical feasibility, and other factors are considered in determining whether additional actions are required.	Standard is generally not considered sufficiently protective of public health, and additional actions are needed to reduce risk.

Source: Developed by OIG staff based on information from EPA

EPA is behind in conducting residual risk reviews. In addition, EPA is behind in conducting technology reviews, required every 8 years after promulgation of MACT and GACT standards for both major and area sources. The Government Accountability Office (GAO) recently found[5] that because EPA issued most of the MACT standards behind schedule, the residual risk reviews "have been pushed back commensurately, thereby delaying any additional public health protection that these reviews may provide." As of June 2007, EPA had completed eight residual risk standards. These standards cover 14 of the 174 MACT source categories for which EPA is required to make a residual risk determination.

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[4] Three EPA MACT standards were vacated by court decisions. As a result of these court decisions, it is now incumbent upon the States to develop emission standards for these three categories and incorporate these standards and compliance dates into State-issued operating permits for the applicable facilities.

[5] *EPA Should Improve the Management of its Air Toxics Program*, Report No. GAO-06-669, June 26, 2006.

Given resource constraints and pending court orders to complete residual risk reviews, EPA has begun a streamlined approach to analyze risks from large groups of source categories at once. In addition, EPA is combining the residual risk reviews with technology reviews for each MACT standard. This combined, streamlined approach is referred to as Risk and Technology Review. This approach is discussed in more detail in Chapter 3.

State and Local Agency Roles in MACT Implementation

Although EPA developed the MACT standards, EPA has generally delegated implementation of the standards to the States. Implementation activities include:

- Incorporating the standards into facility operating permits.
- Providing compliance assistance to regulated facilities.
- Maintaining required records.
- Monitoring compliance.
- Taking enforcement actions against facilities that violate the standard.

Once a standard has been delegated, the State becomes the primary agency for implementation. However, this delegation does not prohibit EPA from enforcing any applicable emission standard or requirement of the MACT.

Three types of activities considered crucial to successful implementation of the MACT standards are compliance assistance, compliance monitoring, and enforcement actions.

- *Compliance assistance* is help provided by regulatory agencies to enhance a facility's understanding of the regulation and increase compliance. Examples include training sessions and workshops, plain language guides, compliance checklists, and applicability flowcharts.

- *Compliance monitoring* consists of activities conducted by regulatory agencies to determine whether a facility is complying with environmental regulations. These activities include full or partial compliance evaluations conducted by qualified inspectors, and review of information submitted by the facility, such as monitoring reports. A full compliance evaluation includes:

    - A review of all required reports and the underlying records.
    - An assessment of air pollution control devices and operating conditions.
    - Observing visible emissions, as appropriate.
    - A review of facility records and operating logs.
    - An assessment of process parameters, such as feed rates, raw material compositions, and process rates.
    - A stack test if there is no other way to determine compliance with the emission limits.

- *Enforcement Actions* consist of actions taken to compel compliance with an environmental statute (such as the CAA), Federal rules and regulations, or federally-enforceable State rules and regulations. Enforcement actions may consist of civil or criminal judicial enforcement proceedings taken as a result of an identified violation.

Noteworthy Achievements

To improve its use in measuring air toxics trends and progress, as well as improve its use for air quality modeling, EPA conducted an extensive revision of the 1990 National Toxics Inventory baseline. The original baseline was comprised of county-level data, but EPA revised the baseline when it created the 1990 National Emissions Inventory (NEI) for air toxics, including providing individual facility point source data. EPA has made other changes to improve the 1990 NEI baseline, including adding missing MACT source categories and updating selected non-point emission estimates and emissions allocation procedures.

Scope and Methodology

We conducted our field work from August 2005 to June 2007 at the EPA Office of Air and Radiation's Office of Air Quality Planning and Standards (OAQPS) in Research Triangle Park, North Carolina; and the EPA Office of Enforcement and Compliance Assurance (OECA) in Washington, DC. We also interviewed managers and collected data from five EPA regions, seven State agencies, and nine MACT-regulated facilities.

We selected three MACT source categories for in-depth analysis from the universe of MACTs with compliance dates prior to 2002. These three were the Petroleum Refinery MACT, the Primary Aluminum MACT, and the Pulp and Paper MACT I & III. For these three MACT categories, we compared 1990 and 2002 NEI emissions of the specific air toxics targeted by the MACT standard. To address the factors associated with the effectiveness of the MACT standards in achieving emission reductions, we selected three facilities from each of the three MACT categories above for additional analyses. We selected these nine facilities based on emissions of certain pollutants of concern contained in the 2002 NEI Version 1.

We conducted this program evaluation in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the evaluation to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our evaluation objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our evaluation objectives.

Appendix A describes our scope and methodology in more detail, including information on prior reports, data limitations, and management control review.

Chapter 2
EPA Inventory Data Show General Decrease in Air Toxics Emissions

EPA data indicate an overall decline in air toxic emissions concurrent with the implementation of the MACT standards. Several factors may have contributed to this decline. These include the requirements of the MACT standards as well as external factors, such as industry trends or other CAA regulations. Some of the decline could also be due to changes in emission calculation methodologies rather than actual changes in emissions. Based on the data available, we were unable to determine the extent to which MACT standards caused emission reductions.

Available Data Has Limitations

While we believe EPA's data can be used to conclude that air toxics emissions are generally declining, we do not attest to the accuracy of the specific emission totals presented in our analyses. EPA's air toxics emission inventory is based on emission estimates developed using methodologies that have varying degrees of reliability. Emissions data obtained from continuous emissions monitoring or source-specific emission tests are generally the preferred method for estimating a source's emissions. Other estimation methodologies, such as emissions factors, are less reliable than source monitoring.

EPA has not quantified the uncertainty associated with the various estimation methodologies used to compile the air toxics emissions inventory. Further, the methodology used to develop facility-specific emission estimates can change over time, resulting in a reported emission reduction being the result of changed methodology rather than an actual decrease in emissions. Chapter 3 discusses the uncertainties and limitations of EPA's air toxics inventory data, and EPA's plans to use this data to conduct residual risk assessments.

NEI Data Suggest Air Toxics Emissions Have Decreased Since MACT Program Implemented

We conducted a number of analyses comparing 1990 and 2002 NEI emissions. Based on our analysis of NEI data pertaining only to MACT standards, we determined that from 1990 to 2002:

- Total air toxics emissions from stationary sources declined by approximately 1.7 million tons.
- Emissions of the six air toxics designated by EPA as presenting the highest cancer risk nationwide have declined.

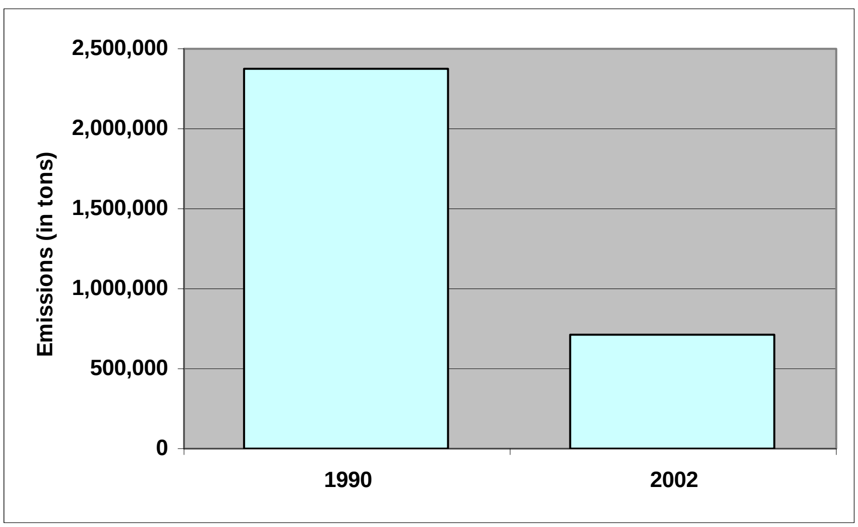
- Overall air toxics emissions declined for the 27 MACTs with compliance dates prior to 2002. Further, the percentage reductions in emissions for 16 of these 27 MACTs met or exceeded the percentage reductions anticipated by EPA when it developed the standards.
- Emissions of the primary air toxics targeted by the petroleum refinery, primary aluminum, and pulp and paper MACTs declined by 93 percent, 37 percent, and 90 percent, respectively.

These downward trends suggest that the MACT standards have helped to reduce air toxics emissions. Based on our interviews with EPA staff, State environmental staff and managers, and industry representatives, other factors also played a role in reducing air toxics emissions. These other factors, which include decreases in production and air rules other than the MACT standards, are discussed later in this chapter. Details on the emissions trends we analyzed follow.

NEI Overall Air Toxics Emissions Declined Between 1990 and 2002

According to the NEI, total air toxics emissions from stationary sources (both major and area) assigned to a MACT category declined by approximately 1.7 million tons, or 70 percent. In computing the total emissions for any given MACT category, we only included emissions of specific air toxics or air toxic categories reported in both 1990 and 2002 for that MACT code. Figure 2.1 illustrates the change.

Figure 2.1: Air Toxics Emissions Assigned to a MACT Code, 1990 – 2002



Source: Developed by OIG staff from NEI data

Appendix B presents the results of our analysis for each MACT category.

NEI Emissions of Key Air Toxics Declined Between 1990 and 2002

EPA's OAQPS had identified six key air toxics, listed in Table 2.1, that present the highest average cancer and non-cancer risks to the public nationwide. The key air toxics are a subset of the 33 Urban Air Toxics and reflect air toxics posing high public health risks.

We compared emissions of these six key air toxics for the 27 MACT standards with compliance dates prior to 2002. This comparison indicated that emissions of the six key air toxics decreased by significant percentages. Aggregate emissions of the key air toxics from these source categories declined by 83 percent over this period. Table 2.1 shows the emissions changes for the six key pollutants.

Table 2.1: Emissions of Key Air Toxics from 1990 to 2002 for MACTs with Compliance Dates Prior to 2002

Key Pollutant	1990 NEI Emissions (Tons per year)	2002 NEI Emissions (Tons per year)	Change (2002-1990) (Tons per year)	(%) Change
Acrolein	822.8	100.1	-722.7	**-88%**
Arsenic[a]	40.9	5.2	-35.7	**-87%**
Benzene	35,301.5	10,083.4	-25,218.2	**-71%**
1,3-Butadiene	14,891.7	606.1	-14,285.6	**-96%**
Chromium VI[b]	251.6	32.4	-219.1	**-87%**
Formaldehyde[c]	17,268.4	1,102.5	-16,165.9	**-94%**
Totals [d]	**68,577.0**	**11,929.8**	**-56,647.2**	**-83%**

[a] = Total includes all arsenic compounds.

[b] = Total includes all chromium compounds. Chromium VI is a subset of this total.

[c] = There is currently a great degree of uncertainty as to the cancer risk posed from inhalation of formaldehyde. OAQPS is currently supporting a cancer potency that would indicate the cancer risks from formaldehyde are not expected to be one of the "key air toxics" as noted above. EPA continues to study the effects of this pollutant and is expecting a resolution on this uncertainty in the near future.

[d] = Totals may not equal due to rounding.

Source: Developed by OIG staff from the NEI databases

NEI Air Toxics Emissions Declined for MACTs with Compliance Dates Prior to 2002

For each of the 27 MACTs with compliance dates prior to 2002, we compared emissions reductions as indicated by the NEI to the emissions reductions anticipated when the MACT standard was developed. The 2002 inventory should represent emissions after the MACT requirements went into effect for these MACTs. For these 27 MACTs, the NEI data show a decline in air toxics emissions of over 1.5 million tons from 1990 to 2002, or 85 percent, for those pollutants recorded in both years' inventories. Further, 16 of these 27 MACTs achieved the emissions reductions that EPA anticipated when the standard was developed.

When developing the MACT standards, EPA normally estimated the emission reductions expected to occur as a result of the MACT. The anticipated reductions, along with the baseline emissions for that MACT category, were generally published in the Federal Register notice or supporting documents for the rule. Table 2.2 presents the results of our review, while Appendix C provides a detailed comparison for each of these 27 MACT standards.

Table 2.2: Status of Anticipated Emissions Reduction Achievement for MACTs with Compliance Dates Prior to 2002

Status of Anticipated Reduction Achievement	No. of MACT Standards	Percent of MACT Standards
Anticipated Reductions Achieved	16	59%
Anticipated Reductions Not Achieved	6	22%
Unable to Determine if Anticipated Reductions Achieved	5	19%
Total	**27**	**100.0**%

Source: Developed by OIG staff from NEI databases

NEI Emissions of Targeted Air Toxics Declined for Three Sample MACTs between 1990 and 2002

We selected the following three MACT standards for a more in-depth analysis of emissions changes:

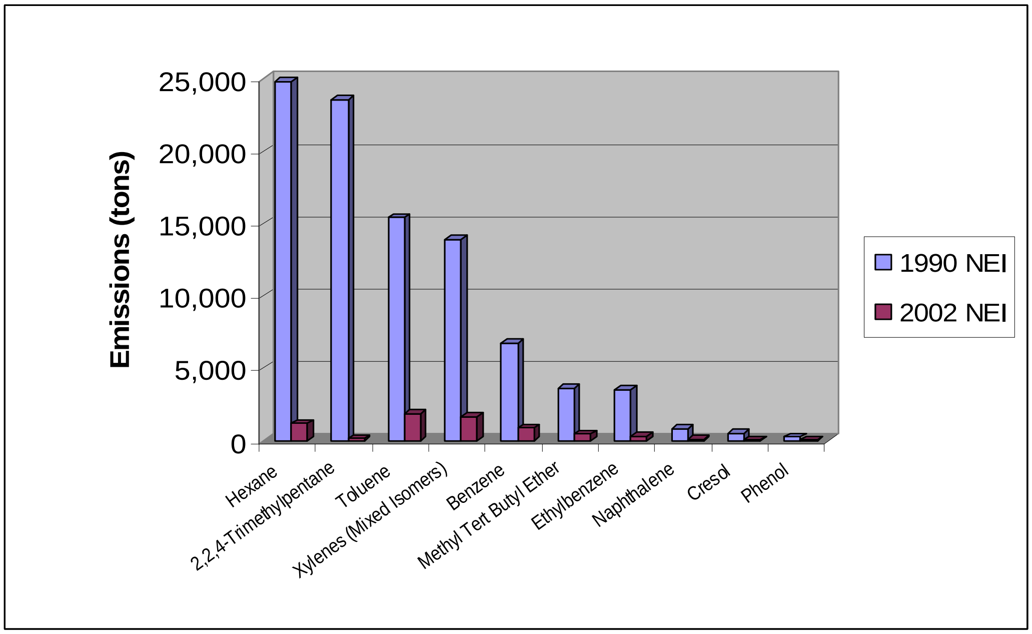
- Petroleum Refinery MACT (Subpart CC),
- Primary Aluminum MACT (Subpart LL), and
- Pulp and Paper MACT I & III (Subpart S).

NEI data indicated that emissions from two of these three MACT categories have declined since implementation of the MACT standard. However, EPA has not yet conducted technology reviews or residual risk assessments for these three MACTs. The residual risk assessments will determine whether the MACT standards are sufficiently protective of public health. For each of the three MACTs, we reviewed changes in emissions of those air toxics specifically targeted by the MACT standard. The results of our analyses follow.

NEI-Reported Emissions for Petroleum Refineries Declined Significantly. NEI data show a significant decline in emissions from the petroleum refinery sector. Industry representatives and EPA staff attributed this decline to the numerous CAA regulations, in addition to the MACT, applicable to this industry. OECA staff also told us that the new source review enforcement initiative resulted in decreased emissions for this industry sector.

The NEI data indicated that total air toxics emissions decreased by over 90,000 tons, or 91 percent, from 1990 to 2002. This exceeded the 59 percent reduction EPA anticipated when the rule was developed. Further, the NEI data indicated that emissions of the primary pollutants targeted by the MACT also declined. Figure 2.2 depicts the emissions of targeted pollutants between 1990 and 2002. Appendix D provides more information on the Petroleum Refinery MACT.

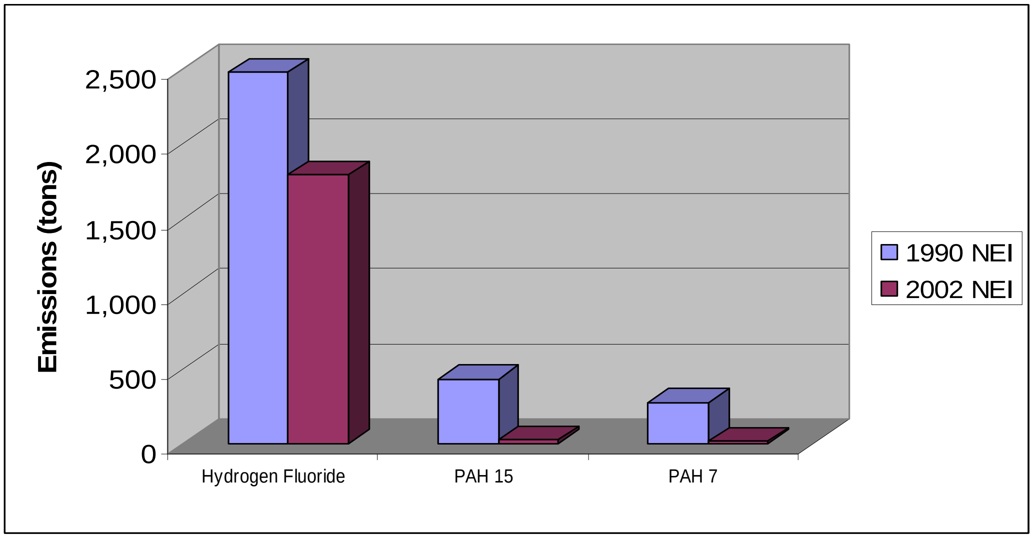
Figure 2.2: Emissions of Targeted Air Toxics for Petroleum Refinery MACT, 1990-2002



Source: Developed by OIG staff from NEI databases

NEI Emissions of Pollutants of Most Concern from Primary Aluminum Production Have Declined. The NEI data indicated that total air toxics emissions increased for the primary aluminum sector because of increases in emissions of carbonyl sulfide. However, emissions of polycyclic aromatic hydrocarbons (specifically PAH-7 and PAH-15) and hydrogen fluoride, which EPA considers the pollutants of most concern from primary aluminum facilities, all declined. According to the NEI, total emissions of these three air toxics declined by 37.4 percent from 1990 to 2002, which did not meet the 50-percent reduction anticipated when the MACT was developed. OAQPS told us that based on industry comments received in response to its Advance Notice of Proposed Rulemaking, it plans to revise the 2002 NEI emission estimates for this sector. Figure 2.3 depicts the emissions of targeted pollutants between 1990 and 2002. Appendix E provides more information on the Primary Aluminum MACT.

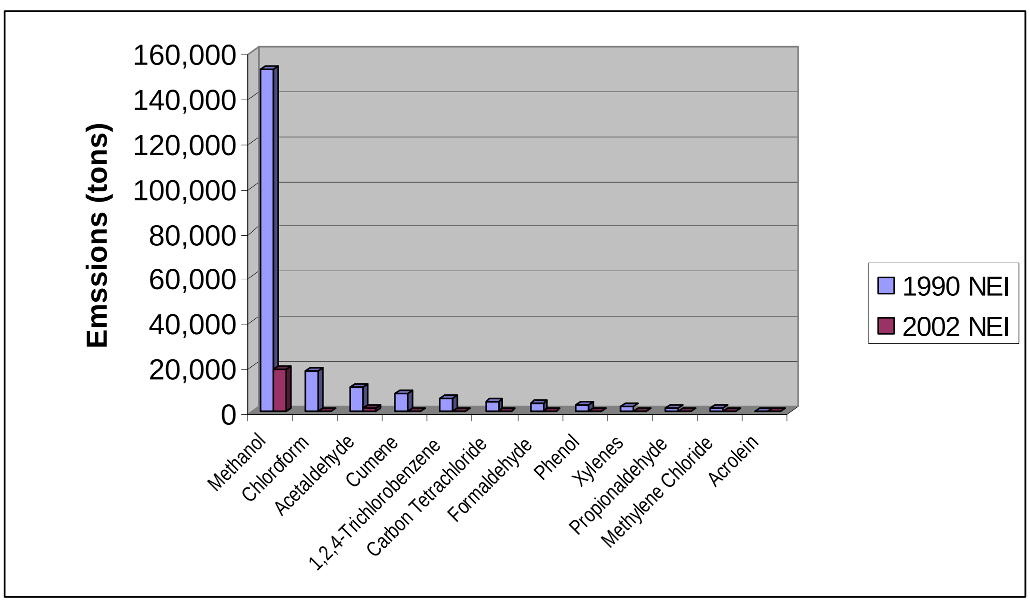
Figure 2.3: Emissions of Targeted Air Toxics for the Primary Aluminum MACT



Source: Developed by OIG staff from NEI databases.

NEI Emissions from Pulp and Paper Have Declined. The NEI data indicated that total air toxics emissions decreased by 192,197 tons, or 90 percent. This overall reduction of 90 percent exceeded the 58 percent reduction EPA anticipated when the MACT standard was developed. Further, the data indicate that emissions of the primary pollutants targeted by the MACT also declined. For example, emissions of formaldehyde, which is a pollutant of concern from pulp and paper mills, declined from 4,124 tons in 1990 to 196 tons in 2002. The following figure depicts the emissions of targeted pollutants between 1990 and 2002. Appendix F provides more information on the Pulp and Paper MACT.

Figure 2.4: Emissions of Targeted Air Toxics for the Pulp and Paper MACT, 1990 - 2002



Source: Developed by OIG staff from NEI databases.

Air Toxics Ambient Monitoring Data Indicate General Reduction in Emissions

Trends in ambient air concentrations can be indicative of trends in air toxics emissions. ERG[6] conducted a study, *Evaluating HAP Trends: A Look at Emissions, Concentrations, and Regulation Analyses for Selected Metropolitan Statistical Areas*, to identify trends in air toxics emissions and ambient concentrations in selected metropolitan areas. This study's results suggest a decline in air toxics[7] concurrent with the implementation of the MACT standards.

The study's objectives included determining whether air toxics-specific Federal regulations have been effective at reducing ambient concentrations of air toxics, and whether air toxics emissions show a decline due to air toxics-specific Federal regulations. The study focused on trends for 9 specific air toxics in 10 metropolitan areas. ERG concluded that ambient concentrations generally declined between 1992 and 2003; during this same period, EPA issued 64 air toxics-specific regulations. The study also noted that air toxics emissions decreased substantially between 1990 and 2002; during that period, EPA implemented over 40 air toxics-specific regulations. The study's authors noted that their analysis was based on the unrevised 1990 NEI and draft 2002 NEI. Our analysis, which was based on the revised 1990 NEI and a later version of the 2002 NEI, showed similar trends.

External Factors and Changes in Emissions Estimation Methods Impact Air Toxics Emissions Reported

Factors external to the MACT standards can cause reductions in air toxics emissions. For example, a decline in production for a particular industry can result in reduced emissions, regardless of the MACT requirements. While it varies by industry and facility, implementation of some National Ambient Air Quality Standards regulations often produces a co-benefit of reducing some air toxics. Similarly, State or local air toxics regulations that are more stringent than Federal MACTs may be responsible for some air toxics emission reductions.

Further, changes in emissions factors or other estimation methods have impacted reported emissions for some source categories. Representatives from six of the eight facilities we contacted said that improved emissions factors and/or increased emissions monitoring[8] have led to more accurate estimates of emissions than in the past. Because reported emissions are often based on emissions factors,

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[6] ERG is a multidisciplinary consulting firm that offers a broad range of services, including environmental services. While EPA is one of ERG's clients, this study was self-initiated and not requested or funded by EPA.

[7] Study results presented October 2006 at the Air and Waste Management Association's Environmental Data Analysis Workshop in Chicago, Illinois.

[8] Of the three MACTs we reviewed in-depth, only the Primary Aluminum MACT required emissions monitoring of air toxics. The other two MACTs required monitoring of processes or surrogate pollutants to determine compliance with the MACT standard.

changes in these factors over time may make it appear that actual emissions have increased or decreased, when in fact it is the estimation methods that have changed. OECA managers and staff told us that a general lack of monitoring requirements for the MACT program impedes their ability to analyze emissions trends and assess the likelihood of potential MACT violations.

Further details on external factors changes in emission estimation techniques for the three MACT standards on which we focused are in Appendices D, E, and F.

EPA and Some State Compliance Monitoring Activities Should Result in Emissions Reductions

While data were not available to assess the overall effectiveness of compliance monitoring activities, the results of specific EPA compliance monitoring initiatives and one State initiative have disclosed significant noncompliance with some MACT standards. Corrective actions to bring the sources into compliance with the MACT should result in reduced air toxics emissions. For example, EPA estimates that its MACT-related enforcement actions for Fiscal Years 2005 and 2006 will result in a projected 332,000 and 356,000 pounds of air toxics reductions, respectively, once the sources come into compliance with the MACT.

We were not able to identify any specific impact on emission reductions from compliance assistance activities (e.g., guidance documents, training workshops, etc.). However, the State and industry representatives we talked with told us that EPA's compliance assistance activities and tools were generally useful. See Appendices G and H for more information on compliance monitoring and assistance activities conducted by EPA.

Key Compliance Monitoring Information Lacking to Evaluate MACT Effectiveness

Sufficient data on all MACT-related compliance monitoring and assistance activities were not available to quantitatively determine the impact of these activities on air toxics emissions. EPA's database for recording MACT-related compliance monitoring activities, generally known as the Air Facility Subsystem (AFS), lacked essential program information needed to conduct such analyses. We noted the following limitations:

- AFS did not identify the specific MACT subpart applicable to a facility.
- AFS did not indicate the pollutants analyzed during stack tests to measure the amount of a specific pollutant or pollutants being emitted through the stacks at a facility.
- AFS did not indicate the specific CAA regulations assessed during partial compliance evaluations.
- Some States did not submit required information to AFS.

In some instances, these data elements were not included because EPA policy did not require States to submit this data. In other instances, incompatibility between State data systems and AFS hampered reporting. The absence of key compliance monitoring information hinders EPA's ability to assess MACT program performance and properly oversee State compliance monitoring efforts.

AFS is the primary source of compliance data for facilities regulated by the CAA, including MACT sources. AFS is comprised of the minimum data requirements that State and local agencies are required to submit for CAA-regulated facilities, such as compliance monitoring activities and enforcement actions. AFS supplies all of the air data to the EPA IDEA (Integrated Data for Enforcement Analysis) system, which is an integrated, multi-media data system that contains information on all EPA-regulated facilities.

The minimum data requirements are approved by the Office of Management and Budget through the Information Collection Request process. The most recent set of minimum data requirements became effective in Fiscal Year 2006. In that year, EPA began requiring States to submit MACT subpart information for each MACT facility. However, this requirement is being phased in and EPA does not expect AFS to contain this information for the entire MACT universe until Fiscal Year 2011. As part of future requests to the Office of Management and Budget, OECA plans to request the addition of partial compliance evaluation and stack test data to the list of minimum data requirements, pending AFS modernization.

Additionally, some States were not reporting all of the minimum data requirements to AFS. For example, staff from Region 5 told us that Illinois had not submitted a large amount of the required minimum data to AFS due to resource constraints and the lack of an interface between the State's database and EPA's AFS database. Texas has also had a long-running problem submitting data to AFS because the State's system was not compatible with AFS. The State recently uploaded new data into AFS, but this update had not yet been completed at the time we conducted our analysis. EPA regional air program managers told us of at least two other States with similar problems, but said these States have since taken action to improve their data submission to AFS.

OECA staff and managers told us that more detailed and complete information on State compliance monitoring activities would enable them to more effectively manage the MACT compliance monitoring program. For example, OECA could compare a facility's emissions trends to the type of compliance monitoring activity conducted at a facility. This information would help OECA evaluate the adequacy of the State's compliance monitoring program and identify whether a State needed additional oversight or guidance. In addition, this information would enable OECA to better target its own compliance monitoring activities.

Conclusions

NEI data and ambient monitoring data indicate that air toxics emissions declined after implementation of the MACT program. Based on our analysis, we believe it is reasonable to conclude that the MACT standards have reduced air toxics emissions. However, because of data limitations, it is uncertain the extent to which emissions reductions have occurred or can be attributed to the MACT standards. In addition to emissions data of questionable reliability, a significant limitation to evaluating the effectiveness of the MACT program is the lack of key information in EPA databases for tracking MACT-related compliance monitoring activities.

Agency Comments and OIG Evaluation

The Agency did not have any comments on this chapter.

Chapter 3
Air Toxics Inventory Data Need to Be Improved Before Being Used in Residual Risk Assessments

EPA needs to improve its NEI data before the Agency uses it to conduct air toxics residual risk assessments. The quality of EPA's air toxics inventory data has taken on increased importance with EPA's decision to rely on NEI data to conduct residual risk assessments. Residual risk assessments require accurate facility-specific emission data in order for EPA to determine the public health risk resulting from exposure to air toxics. However, EPA has not established data quality objectives specifying the quality of data needed for this decision making process as recommended by EPA guidance. Further, EPA continues to rely on voluntary efforts to collect air toxics emissions data from States, which hampers its ability to obtain complete, consistent, and timely data. If emissions and the subsequent risk derived from those emissions for specific source categories are understated, important regulations to protect public health may go undeveloped. Conversely, if emissions are overstated, requirements that are not cost-beneficial could be placed on industries.

Reliability of NEI Data is Uncertain

Air toxics emissions data come from several sources, often with associated data limitations. Data sources for the NEI include State-reported data, data gathered by EPA during industry-specific rulemakings, industry-reported data from the Toxics Release Inventory, and data derived from national estimates. Further, the methodology used to develop emission estimates reported in the NEI can differ between and within the sources of the data. For example, different States may use different methodologies to develop the emission estimates sent to EPA. Also, most air toxics emissions data are provided to EPA on a voluntary basis.

Review of the point source codes for EPA's 2002 NEI data showed improvement from the 1990 NEI data. The source codes identify the sources of data used in the development of NEI data, and are useful in evaluating the data's quality. We found data source codes for point sources generally to be well populated in EPA's 2002 NEI.

Within EPA's NEI database, Emission Calculation Method Codes (ECMCs) are used to indicate how emissions measurements are derived. ECMCs provide important information on the quality of the emissions data, since the reliability of emissions estimates varies greatly based on the calculation method used. We reviewed ECMC records from an updated dataset of 2002 NEI point sources provided by EPA's Emissions Inventory and Analysis Group in June 2007. We found that the ECMS field was blank for 57 percent of the data points. The proportion of the unpopulated records represented about 39 percent of total point source emissions. Further, emissions factors accounted for 37 percent of the data points and nearly 40 percent of the reported emissions. Emissions factors are representative values that relate the amount of pollutant emitted to the atmosphere to an activity associated with the source (e.g., kilograms of nitrogen oxide emitted per unit of fuel burned). As noted in prior OIG reports, emissions estimates derived from emissions factors are generally not considered to be of high quality, particularly for site-specific emissions estimates, and EPA recommends against such use. Table 3-1 shows the number and types of ECMCs recorded for the 2002 NEI Data.

Table 3-1: Type and Number of Emission Calculation Methods Used for NEI Data

Emission Calculation Method Code	Emission Calculation Method Description	Number of Records	Percentage of Records	Emissions (Tons per year)	Proportion of Emissions
NA	NO EMISSION CALCULATION METHOD CODE	1,022,797	56.60%	363,240	38.96%
01	CONTINUOUS EMISSIONS MONITORING SYSTEM	5,707	0.32%	13,004	1.39%
04	STACK TEST	14,786	0.82%	27,023	2.90%
03	MATERIAL BALANCE	48,953	2.71%	86,587	9.29%
08	EPA EMISSION FACTOR	315,330	17.45%	252,474	27.08%
09	STATE/LOCAL EMISSION FACTOR	329,384	18.23%	53,483	5.74%
10	SITE-SPECIFIC EMISSION FACTOR	8,920	0.49%	36,200	3.88%
11	VENDER EMISSION FACTOR	4,680	0.26%	19,075	2.05%
12	TRADE GROUP EMISSION FACTOR	11,634	0.64%	7,832	0.84%
05	EPA SPECIATION PROFILE	12,151	0.67%	6,480	0.70%
06	STATE/LOCAL SPECIATION PROFILE	106	0.01%	109	0.01%
07	MANUFACTURER SPECIFICATION	736	0.04%	1,213	0.13%
02	ENGINEERING JUDGMENT	31,895	1.77%	65,518	7.03%
	Totals [a]	**1,807,079**	**100.00%**	**932,237**	**100.00%**

[a] = Totals may not equal due to rounding.

Source: Data extracted from the NEI National Output format database by OAQPS.

The heavy use of emissions factors in the NEI makes the reliability of the data highly uncertain. Emissions factors can result in emissions data of questionable reliability, particularly at the facility level. For example, managers at two primary aluminum plants we contacted stated that they found the emissions factors used to estimate hydrogen fluoride emissions were underreporting emissions prior to implementation of the MACT requirements. A prior OIG report also noted instances where the use of unreliable emissions factors resulted in underreporting of emissions. Additionally, the Agency has not completed the corrective actions for the emissions factors program it agreed to address based on a March 2006

OIG report.[9] Our prior report noted that the percentage of emissions factors rated below average or poor increased from 56 percent in 1996 to 62 percent in 2004.

The most reliable methods of measuring emissions as indicated in EPA's 2002 NEI documentation are continuous emissions monitoring systems (CEMS) and stack tests. However, actual measurements such as stack tests and CEMS account for less than 2 percent of the measurements and less than 5 percent of total emissions. Further, this percentage is unlikely to improve since, according to EPA staff, none of the MACT standards requires air toxics to be measured by CEMS. The lack of emissions calculation methodology data, coupled with the heavy reliance on emissions factors to develop the NEI, casts doubt on the quality and reliability of NEI data for making residual risk decisions.

The NEI data are an important starting point for the residual risk process. The NEI data are input into air quality models used to estimate ambient air toxic concentrations. In turn, these modeled ambient concentrations are input into other models that estimate public health risk from exposure to air toxics. The public health risk estimate is a key factor in EPA deciding whether or not to issue additional standards to reduce air toxics emissions.

EPA and Other Studies Have Noted Uncertainties with Air Toxics Data

EPA's OAQPS acknowledged that there are uncertainties in the NEI data when it submitted its residual risk plan to the Science Advisory Board for review. OAQPS noted that:

> . . . *the accuracy of emissions values will vary depending on the source of the data present in NEI, incomplete or missing data, errors in estimating emissions values, and other factors. Additionally, some emission values in the ANPRM* [Advance Notice of Proposed Rulemaking] *data set are estimates developed from emission factors, mass-balance calculations, or other methods and thus lack the precision and verifiable nature of actual stack measurements. Even stack measurements have associated uncertainty due to factor[s] such as measurement error and the long–term representativeness of monitoring data.*

OAQPS also acknowledged that some of the NEI data were incomplete, as follows:

> *The NEI contains incomplete emissions data for some source categories. With regard to these source categories, we derived emissions data from the 1999 NEI, which, absent more specific or recent data, we assumed to be equivalent to 2002 emissions. Where*

[9] *EPA Can Improve Emissions Factors Development and Management*, Report No. 2006-P-00017, March 22, 2006.

data were not available in the 1999 NEI, we derived data from the Toxics Release Inventory (TRI). TRI emissions values are not subject to the same QA procedures that NEI estimates are, and the TRI database lacks some data fields and levels of specificity that are required for accurate dispersion modeling.

EPA's Science Advisory Board reviewed EPA's Risk and Technology Review plan and made several recommendations for improving the residual risk process in a June 2007 memorandum to the EPA Administrator. The following two recommendations in particular addressed the role of the NEI accuracy and uncertainty of the emissions data:

- The plan should incorporate a framework for improving the NEI as new/more accurate data become available. There is a concern that the use of the voluntary NEI data base for a regulatory purpose could induce changes in reporting that modify the data base.

- A sensitivity analysis should be conducted to determine: (1) which inputs are the main drivers of the residual risk estimates, and (2) if differences in the levels of uncertainty for those inputs (for example, uncertainties in emissions from some sources compared to others) may potentially result in misclassification.

EPA plans to do a sensitivity analysis for the more complex residual risk assessments with higher estimated risks that may trigger the need for additional standards. EPA did not conduct sensitivity analyses for the first eight assessments conducted under its current Risk and Technology Review approach, since EPA determined that these categories posed low risks. EPA plans to rely on its current approach for improving the NEI data and the premise that using the data to conduct residual risk assessments will induce improvements in NEI reporting.

An August 2005 NARSTO report[10] discussed the uncertainty associated with air toxics inventories. NARSTO noted that:

The data that do exist for these pollutants are generally derived not from direct measurements, but from models that frequently rely on limited out-of-date data, and which are rarely subject to analyses of uncertainty.

Data Quality Objectives Have Not Been Established

EPA guidance recommends the use of the Data Quality Objectives Process when using environmental data. However, EPA has not established data quality objectives for using NEI data in residual risk assessments. According to EPA's

[10] *Improving Emission Inventories for Effective Air Quality Management Across North America*, NARSTO 05-001, August 2005. NARSTO is a public/private partnership including the United States, Canada, and Mexico that was formed to improve management of air quality in North America.

February 2006 *Guidance on Systematic Planning Using the Data Quality Objectives Process:*

> *EPA developed the Data Quality Objectives (DQO) Process as the Agency's recommended planning process when environmental data are used to select between two alternatives or derive an estimate of contamination. The DQO Process is used to develop performance and acceptance criteria (or data quality objectives) that clarify study objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of data needed to support decisions.*

The Data Quality Objectives Process also calls for the user to establish "acceptable quantitative criteria on the quality and quantity of the data to be collected, relative to the ultimate use of the data." These acceptance criteria typically involve measures of precision, bias, representativeness, completeness, comparability, and sensitivity.

EPA's plan for conducting residual risk assessments does not include pre-established performance criteria for accepting the NEI air toxics emissions data. Instead, EPA issued an Advance Notice of Proposed Rulemaking asking for public comments on the NEI data EPA plans to use in its residual risk assessments. At the time we issued our report, EPA was reviewing the public comments and revising the inventory where comments supported changes. According to OAQPS staff, comments had resulted in a 4-percent decrease in NEI total emissions as of the end of July 2007. EPA has also begun to qualitatively rank the data from A to E. OAQPS plans to consider these qualitative rankings when conducting residual risk assessments to the extent they are available. Although OAQPS plans to describe the limitation and uncertainties associated with the NEI data, it does not plan to reject data based on its quality.

No Reporting Requirement for Air Toxics Emissions Data

Since EPA has not established an air toxics emissions reporting requirement, EPA continues to employ voluntary efforts to collect air toxics emissions data. While the percentage of State-reported data has increased from 54 percent in 1990 to 67 percent in 2002, EPA's reliance on voluntary efforts to provide air toxics NEI data has not provided assurance that the data are accurate and reliable. A reporting requirement would help ensure that all States submit data, the States submit data in a consistent format, and the data include important information such as the methodology used to develop the data. Although our 2004 report[11] on air toxics recommended that EPA develop such a requirement, EPA did not implement our recommendation because EPA questioned whether it had the statutory authority to require the inventories. In contrast, EPA does require States

[11] *EPA's Method for Calculating Air Toxics Emissions for Reporting Results Needs Improvement*, Report No. 2004-P-00012, March 31, 2004.

to submit emissions data for criteria pollutants in accordance with the requirements of the 2002 Consolidated Emissions Reporting Rule.

According to OAQPS staff, EPA considered including an air toxics emissions reporting requirement in a January 2006 proposed Air Emissions Reporting Requirements rule. Although this proposed rule did not include such a requirement, EPA received a comment from the National Association of Clean Air Agencies[12] strongly encouraging EPA to require Title V facilities[13] to report air toxics emissions data. As of April 2007, the final rule had not been published. OAQPS management and staff re-iterated that the lack of clear statutory authority to establish an air toxic reporting requirement was a major obstacle to implementing this rule.

Use of NEI Inventory Data Could Result in Unreliable Residual Risk Assessments

EPA's residual risk assessments and the resulting decisions of whether to develop residual risk standards represent a significant CAA requirement. These decisions can have important ramifications for public health and control costs for affected industries. Uncertainties or errors in the air toxics emissions inventories used to develop these risk assessments could impact EPA's final decisions. EPA's Data Quality Objectives guidance describes the potential impact of data errors on decisions as follows:

> . . . *these data* [that is, data used in decision-making] *are subject to various types of errors due to such factors as how samples were collected, how measurements were made, etc. As a result, estimates or conclusions that you make from the collected data may deviate from what is actually true within the population. Therefore, there is a chance that you will make erroneous conclusions based on your collected data or that the uncertainty in your estimates will exceed what is acceptable to you.*

With respect to residual risk decisions, if emissions and the subsequent risk derived from those emissions are understated, EPA may not develop regulations that are needed to protect public health. Conversely, if emissions and the subsequent residual risk are overstated, regulatory requirements that are not cost effective could be placed on industries.

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[12] This association represents air pollution control agencies in the 50 U.S. States, 4 U.S. Territories, and over 165 metropolitan areas. The association was formerly known as STAPPA/ALAPCO (State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials).
[13] All major sources (i.e., any source that emits or has the potential to emit 100 tons or more a year of any criteria pollutant), and certain areas sources are required by the 1990 CAA Amendments to obtain Title V permits. A Title V permit grants a source permission to operate, and includes all air pollution requirements that apply to the source. It also requires that the source report its compliance status with respect to permit conditions.

Conclusions

EPA has not established a process to ensure that the air toxics emissions data used in residual risk assessments meet data quality objectives as recommended by Agency guidance. Ideally, data that meet pre-determined performance criteria should be used for residual risk decisions because of the significant impact these decisions could have on the public's health and the regulated community. While OAQPS plans to characterize the limitations and uncertainties of their risk assessments, these characterizations as planned would not quantitatively describe the range of the potential errors associated with these assessments.

Recommendations

We recommend the Principal Deputy Assistant Administrator for Air and Radiation:

3-1 Establish data quality objectives for data used in conducting residual risk assessments.

3-2 Revise the Consolidated Emissions Reporting Rule to require standardized State reporting requirements and methods for calculating air toxics emissions data.

Agency Comments and OIG Evaluation

The Agency did not express disagreement with the report's findings, but disagreed with several conclusions as well as with the OIG's recommendations. The Agency stated that it plans to improve the quality and consistency of the NEI data, but does not commit to establishing data quality objectives. The Agency agreed that establishing air toxics emissions reporting requirements could improve the quality of NEI data. However, the Agency said that such requirements were not appropriate at this time. Thus, the Agency plans to continue to rely on voluntary efforts to obtain air toxics NEI data.

We do not believe the Agency's response sufficiently addresses the problems disclosed in this report, and we consider the issues unresolved. A summary of the Agency's response to each recommendation and our evaluation of the Agency's comments follows. A copy of the Agency's complete response is included in Appendix I.

Recommendation 3-1

The Agency disagreed with our recommendation that it establish data quality objectives for data used in conducting residual risk assessments. The Office of Air and Radiation commented that quantifiable data quality objectives or acceptance criteria for the use of data within the NEI were not practicable or appropriate within the current assembly and use of the NEI. The Office of Air and Radiation noted that for the NEI, it uses a Quality System based on an acceptance process to determine if the inventory is suitable for the purpose(s) for which it is to be used. According to the Office of Air and Radiation, this process includes numerous quality reviews by both EPA and its State/local partners and generally incorporates multiple elements, such as: (1) data/information flow monitoring and checks; (2) clear decision points in the data flow; (3) decisions by professional experts in assessing data elements through mass balance calculations, statistical determinations, and other tools; and (4) data acceptance determinations regarding the usability of the data/information for the intended purpose.

The OIG continues to believe that data quality objectives should be established for emissions data used in conducting residual risk assessments. As the Office of Air and Radiation noted in its response, the intended use of data determines the quality of data needed. In the case of the Risk and Technology Review process, the emissions data serve as the foundation for EPA's residual risk assessments and the establishment of residual risk standards under section 112(f) of the CAA. In response to EPA's Advance Notice of Proposed Rulemaking, several State agencies and industry groups cited NEI data quality problems and questioned its suitability for residual risk assessments. Of particular note:

- The National Association of Clean Air Agencies expressed serious concerns about the quality of NEI data and its use in conducting residual risk assessments, and suggested that EPA use its CAA section 114 authority to collect the emissions data needed for residual risk assessments.
- The American Shipbuilding Association stated that it was deeply concerned about EPA making decisions affecting their industry "based upon an unrealistic selection of data that is not only incomplete and inaccurate, but one that almost seems to disregard the importance of relevance as a determinative factor." They also stated that "Some of the data is by far too inaccurate to be used for modeling and residual risk assessment for individual facilities."
- The American Petroleum Institute expressed similar concerns in stating that "It is inappropriate for the Agency to use low quality data on the basis that the regulated community did not provide better data. Yet this is what the Agency proposes to do for the RTR [Risk and Technology Review] 2 rulemaking." In order to obtain better data, the American Petroleum Institute recommended that EPA work directly with sources to obtain the information voluntarily, use its section 114 authority, or promulgate a rule requiring the submission of necessary data.

As noted in comments to the Advance Notice of Proposed Rulemaking, the existing NEI database is not the only option for obtaining emissions data for risk assessments. The Agency has explicit authority under CAA section 114 to obtain emissions data from stationary sources in order to develop or assist in the development of any emissions standard under section 112. The Agency could use such authority to collect emissions data for residual risk assessments if NEI data are not of sufficient quality.

Recommendation 3-2

The Office of Air and Radiation agreed that establishing requirements for reporting air toxics emissions data to the NEI could improve the quality of such data. However, the Agency commented that such requirements were not appropriate at this time. The Agency pointed to its evolving efforts to improve the air toxics emission inventory by working with its State and local partners and industry.

EPA outlined several reasons why an air toxics emissions reporting requirement was needed when it proposed the 2002 Consolidated Emissions Reporting Rule. In the rule's proposal EPA stated that air toxics emissions inventories were needed to: conduct better oversight of the Title V program; develop and assess progress of the CAA-required control strategy for reducing public health risk from area sources; and assess progress in meeting Government Performance and Results Act goals for reducing the public's cumulative health risk from exposure to air toxics emissions. Although it did not include an air toxics reporting requirement in the final rule, EPA stated that it planned "to develop HAP reporting measures at a future date." EPA continues to rely on voluntary reporting efforts which, in our view, have not provided reasonable assurance that the NEI data are accurate and reliable. Given the Agency's decision to also use NEI data for residual risk assessments, we believe it is inappropriate for the Agency to delay implementation of an air toxics reporting requirement to improve data quality.

As mentioned above, EPA already has authority under CAA section 114 to collect air toxics emissions data from stationary sources. Thus, the Agency could use section 114 authority to obtain data for residual risk assessments, even if routine reporting of air toxics emissions was not required at this time.

Status of Recommendations and Potential Monetary Benefits

RECOMMENDATIONS						POTENTIAL MONETARY BENEFITS (in $000s) [2]	
Rec. No.	Page No.	Subject	Status[1]	Action Official	Planned Completion Date	Claimed Amount	Agreed To Amount
3-1	23	Establish data quality objectives for data used in conducting residual risk assessments.	O	Principal Deputy Assistant Administrator for Air and Radiation			
3-2	23	Revise the Consolidated Emissions Reporting Rule to require standardized State reporting requirements and methods for calculating air toxics emissions data.	O	Principal Deputy Assistant Administrator for Air and Radiation			

[1] O = recommendation is open with agreed-to corrective actions pending;
C = recommendation is closed with all agreed-to actions completed;
U = recommendation is undecided with resolution efforts in progress.

[2] Identification of potential monetary benefits was not an objective of this evaluation.

Appendix A

Details on Scope and Methodology

To address the extent to which MACT standards have reduced air toxics and achieved the emission reductions anticipated, we assessed the changes in air toxics emissions between 1990 and 2002 using EPA's NEI. Since all of the MACTs were promulgated after passage of the 1990 CAA Amendments, the 1990 NEI serves as a baseline of pre-MACT air toxics emissions. The 2002 NEI was the most current inventory available. After we had completed the majority of our field work and analyses, EPA released an updated version of the 2002 inventory in March 2007. Accordingly, we updated our analyses using the March 2007 revised updated NEI data. This latest update is generally known as NEI 2002 Version 3. Our overall analyses of MACT emissions included the following:

- First, we compared 1990 and 2002 emissions for only those emissions assigned to specific MACT codes. Since differences exist between the 1990 and 2002 inventories, we used only NEI records that were comparable between the 2 years' inventories when comparing emissions for specific MACT categories. That is, we only included emissions for air toxics that were included in both inventories for that MACT category. After presenting our preliminary results to OAQPS, they commented that our emissions totals did not accurately account for certain categories of air toxics. This was typically the case for speciated pollutants such as Polycyclic Organic Matter (POM), Chromium, Xylene, and Cresol that needed to be compared on a category basis. The HAP category is an EPA convention that includes all the species of a particular HAP. We adjusted our MACT category emission totals to properly account for speciated toxics as recommended by OAQPS. These adjustments did not materially impact the total MACT emissions.

- Second, we compared 1990 and 2002 emissions for only those MACT standards that had compliance dates prior to 2002. Since these MACT source categories should have been in compliance before 2002, the 2002 NEI should serve as a post-MACT measure of air toxics emissions reductions.

- We also compared emissions of the 6 key HAPs from these 27 MACT categories in 1990 and 2002. The key HAPs are those air toxics identified by OAQPS as posing the highest cancer and non-cancer risks on average nationwide.

We selected three MACT source categories for more in-depth analysis. We selected these MACTs from the universe of MACTs with compliance dates prior to 2002. We used the following criteria in selecting the three MACTs for in-depth analyses:

- Air toxics emissions from the source category pose a relatively large public health risk.
- The NEI data for the source category are among the most reliable/accurate.
- Anticipated emission reductions from the MACT are large.
- Changes in air toxics emissions are not due to obvious external factors.

The following table illustrates the three MACTs selected using the above criteria:

Table A.1: MACTS Selected for Review

MACT	Date Issued	No. Air Toxics Targeted by the MACT Standard
Petroleum Refinery MACT (Subpart CC)	August 18, 1995	10
Primary Aluminum MACT (Subpart LL)	October 7, 1997	3
Pulp and Paper MACT I & III (Subpart S)	April 15, 1998	13

Source: Developed by OIG staff based on information from EPA

We also interviewed EPA staff and industry groups, and conducted literature searches, to identify external factors that may have impacted emissions for these three MACT categories.

To address what factors are associated with the effectiveness of the MACT standards in achieving emission reductions, we selected nine facilities from the three MACTs above for even greater in-depth analyses. We selected these nine facilities based on emissions of certain pollutants of concern contained in the 2002 NEI Version 1. Specifically:

- For the Petroleum Refinery MACT, we selected the three facilities with the highest reported emissions of benzene. We used benzene because EPA had identified benzene as one of six key HAPs, and petroleum refineries are large emitters of benzene.

- For the Primary Aluminum MACT, we selected the three facilities with the highest reported emissions of POM. We used POM because it is highly toxic and is a common pollutant from primary aluminum smelters.[14]

- For the Pulp and Paper MACT I & III, we selected the three facilities with the highest reported emissions of formaldehyde. We used formaldehyde because EPA had identified it as one of six key HAPs, and pulp and paper mills are relatively large emitters of formaldehyde.[15]

For each of these nine facilities, we reviewed and compared emissions data from the TRI and NEI, as well as compliance and enforcement data from EPA's IDEA system. We conducted semi-structured interviews with representatives from the facilities, and also with agency staff from the States in which the facilities are located. We also conducted interviews with staff from the EPA regions where these facilities and States are located. However, because of limitations in the compliance monitoring and compliance assistance data, we were unable to fully address our objective of determining whether there was an association between compliance monitoring and compliance assistance activities and emission trends. Instead, we relied upon interviews of knowledgeable individuals and various studies to qualitatively assess the impact of compliance monitoring and compliance assistance on air toxics emissions reductions from MACT sources. Since the three MACT categories and nine facilities we selected for in-depth review were not

[14] One of the top emitters of POM in the primary aluminum industry was not in operation at the time of our review, so we selected the next highest emitter to be part of our sample.
[15] According to EPA staff, in the last 3-4 years, the toxicity risk for formaldehyde has been lowered, and is no longer considered a key HAP, but controversy remains over this action.

randomly selected, our findings and recommendations may not be representative of the MACT universe as a whole.

While conducting field work, we identified several significant problems with the NEI data, and learned that EPA is planning to use the 2002 NEI to conduct residual risk analyses for a large number of source categories under the Risk and Technology Review process.[16] Given our concerns with the quality of the air toxics emissions inventory data and EPA's intent to use this same data to make regulatory decisions, we conducted additional steps not included in our original project plan and evaluation objectives. For example, we reviewed documents pertaining to the Risk and Technology Review process, reviewed the updated Risk and Technology Review data files, and interviewed EPA staff involved in the residual risk process.

Locations Reviewed

Our evaluation focused on two EPA headquarters offices: (1) OAQPS within the Office of Air and Radiation, and (2) OECA. OAQPS, located in Research Triangle Park, North Carolina, developed the MACT standards and many of the compliance assistance tools for affected industries to use in reducing air toxics emissions. OECA, located in Washington, DC, is responsible for ensuring compliance with the MACT standards. Since the regions and States do most of the actual implementation of the MACT standards, we also contacted the following five regions and seven States:

Table A.2: Regions and States Contacted

EPA Region	States
Region 3 - Philadelphia	West Virginia
Region 4 - Atlanta	Mississippi, South Carolina
Region 5 - Chicago	
Region 6 - Dallas	Oklahoma, Texas
Region 7 - Kansas City	Kansas, Missouri

Source: Developed by OIG staff

Additionally, to determine how facilities calculated their reported emissions and the extent to which external factors may have influenced reported reductions, we interviewed representatives of eight of the nine facilities selected for greater in-depth analyses. Representatives from one pulp and paper facility, despite repeated attempts to schedule an interview, did not respond to our requests. We also conducted interviews with outside stakeholders.

Review of Management (Internal) Controls

Government Auditing Standards require that auditors obtain an understanding of internal controls significant to the audit objectives and consider whether specific internal control procedures have been properly designed and placed in operation. Our overall objective was to determine the extent to which MACT standards have reduced air toxics and achieved the emission reductions anticipated. We reviewed management controls related to the objective of this evaluation. This included EPA's policy and procedures for administering and managing the MACT Program for

[16] As explained in Chapter 3, EPA has asked stakeholders to review the NEI data for 22 MACT source categories before using the data to complete the mandated residual risk analyses.

the three sample MACT categories issued by EPA's OAQPS. As part of this review, we examined analytical, documentary, and testimonial evidence from five EPA regions, seven States, and nine facilities (three each in the Petroleum Refinery industry, Primary Aluminum industry, and the Pulp and Paper industry).

We found the internal controls did not ensure reliable data from the AFS. This system is the primary source of compliance data for facilities regulated by the CAA, including MACT sources. Our concerns with this system are discussed in Chapter 2. We also found the internal controls did not ensure that data generated by or for OAQPS are of known and acceptable quality. Our concerns with data quality are discussed in Chapter 3.

Data Limitations

EPA has taken steps to improve the NEI since our 2004 report (see "Prior Reports" below) discussed concerns with the accuracy of air toxics emissions data. These improvements include revisions made to the 2002 NEI after we started our field work. However, as discussed in Chapter 3, significant data quality concerns still exist with this inventory.

The reliability of trends analyses is limited by improvements to the 2002 data, which impacts the comparability of this data to the 1990 data. For example, changes to the 2002 NEI have resulted in:

- increases in the number of facilities and emissions sources,
- increases in the number of air toxics with reported emissions, and
- changes in the MACT code assigned to some sources.

Prior Reports

The OIG conducted one prior evaluation that indirectly related to the effectiveness of the MACT standards. This report, *EPA's Methods for Calculating Air Toxics for Reporting Needs Improvement* (2004-P-00012), issued March 31, 2004, noted that EPA was measuring the overall air toxics program's progress based on total air toxics emissions reductions without considering the toxicity of the pollutants. The report recommended that EPA include a risk-based factor in its program measurement. In response to our recommendation, EPA has started using toxicity-weighted measures to evaluate the air toxics program.

The OIG and GAO conducted several prior audits/evaluations that addressed EPA's development of the MACT standards in accordance with the timelines established by the CAA and efforts to incorporate MACT requirements into individual facility operating permits. These prior reports did not specifically review the effectiveness of the MACT standards in reducing air toxics emissions. These prior reports are:

Prior OIG Reports:

- *EPA and State Progress in Issuing Title V Permits*, Report No. 2002-P-00008, March 29, 2002
- *Substantial Changes Needed in Implementation and Oversight of Title V Permits If Program Goals Are To Be Fully Realized*, Report No. 2005-P-00010, March 9, 2005

Prior GAO Reports:

- *Air Pollution: Status of Implementation and Issues of the Clean Air Act Amendments of 1990*, GAO/RCED-00-72, April 2000
- *EPA Has Completed Most of the Actions Required by the 1990 Amendments, but Many Were Completed Late*, GAO-05-613, May 2005
- *EPA Should Improve the Management of Its Air Toxics Program*, GAO-06-669, June 2006

Amount and Percent of Change in NEI Air Toxics Emissions Between 1990 and 2002

MACT Source Category	1990 NEI (tons per year)	2002 NEI Version 3 (tons per year)	Change (2002-1990) (tons per year)	Percent Change (2002-1990)
Aerospace Industries	209,666	2,305	-207,361	-99%
Agricultural Chemicals and Pesticides Manufacturing	1,147	1,433	286	25%
Auto & Light Duty Truck (Surface Coating)	35,565	6,762	-28,803	-81%
Boat Manufacturing	8,868	7,325	-1,543	-17%
Brick and Structural Clay Products Manufacturing	5,562	6,635	1,073	19%
Carbon Black Production	6,970	1,550	-5,420	-78%
Cellulose Products Manufacturing	4,696	2,182	-2,514	-54%
Chromium Electroplating	184	5	-179	-97%
Clay Ceramics Manufacturing	982	771	-211	-21%
Coke Ovens: Charging, Top Side, and Door Leaks	2,214	64	-2,150	-97%
Coke Ovens: Pushing, Quenching, & Battery Stacks	904	1,327	423	47%
Commercial Sterilization Facilities	308	46	-262	-85%
Dry Cleaning Facilities: Perchloroethylene	77,698	22,117	-55,581	-72%
Engine Test Cells/Stands	745	716	-29	-4%
Ethylene Processes	439	500	61	14%
Ferroalloys Production	714	293	-421	-59%
Flexible Polyurethane Foam Fabrication Operations	12	20	8.00	67%
Flexible Polyurethane Foam Production	16,335	2,589	-13,746.00	-84%
Friction Materials Manufacturing	1,948	225	-1,723.00	-88%
Gasoline Distribution (Stage I)	33,241	80,028	46,787	141%
Halogenated Solvent Cleaners	137,982	39,451	-98,531	-71%
Hazardous Waste Incineration: Commercial	10,605	9,616	-989	-9%
Hydrochloric Acid Production	61,048	399	-60,649	-99%
Hydrogen Fluoride Production	4	5	1	25%
Industrial/Commercial/ Institutional Boilers & Process Heaters	30,323	221,990	191,667	632%
Integrated Iron & Steel Manufacturing	11,444	706	-10,738	-94%
Iron and Steel Foundries	7,658	1,628	-6,030	-79%
Large Appliance (Surface Coating)	12,027	2,498	-9,529	-79%
Leather Tanning & Finishing Operations	2,508	216	-2,292	-91%
Lime Manufacturing	1	999	998	99800%
Magnetic Tapes (Surface Coating)	4,478	434	-4,044	-90%
Manufacture of Nutritional Yeast	254	93	-161	-63%
Marine Vessel Loading Operations	7,449	216	-7,233	-97%
Mercury Cell Chlori-Alkali Plants	88	18	-70	-80%

MACT Source Category	1990 NEI (tons per year)	2002 NEI Version 3 (tons per year)	Change (2002-1990) (tons per year)	Percent Change (2002-1990)
Metal Can (Surface Coating)	40,574	3,797	-36,777	-91%
Metal Coil (Surface Coating)	4,013	2,285	-1,728	-43%
Metal Furniture (Surface Coating)	15,664	759	-14,905	-95%
Mineral Wool Production	3,253	482	-2,771	-85%
Miscellaneous Coating Manufacturing	8,853	3,988	-4,865	-55%
Miscellaneous Metal Parts & Products (Surface Coating)	61,134	8,643	-52,491	-86%
Miscellaneous Organic Chemical Manufacturing	96,625	8,507	-88,118	-91%
Municipal Landfills	309	28,945	28,636	9267%
Natural Gas Transmission & Storage	469	2,153	1,684	359%
Off-Site Waste and Recovery Operations	435	17	-418	-96%
Oil & Natural Gas Production	42,589	21,541	-21,048	-49%
Organic Liquids Distribution (Non-Gasoline)	147	1,146	999	680%
Paper & Other Webs (Surface Coating)	30,706	3,059	-27,647	-90%
Petroleum Refineries - Catalytic Cracking, Catalytic Reforming, & Sulfur Plant Units	3,793	1,030	-2,763	-73%
Petroleum Refineries - Other Sources Not Distinctly Listed	101,305	8,717	-92,588	-91%
Pharmaceutical Production	40,958	2,458	-38,500	-94%
Phosphate Fertilizers Production	558	117	-441	-79%
Phosphoric Acid Manufacturing	128	62	-66	-52%
Plastic Parts & Products (Surface Coating)	58,696	8,015	-50,681	-86%
Plywood and Composite Wood Products	18,702	10,124	-8,578	-46%
Polyether Polyols Production	3,699	170	-3,529	-95%
Polymers and Resins I &II	26,248	4,763	-21,485	-82%
Polymers and Resins III	1,082	2,042	960	89%
Polymers and Resins IV	4,008	730	-3,278	-82%
Polyvinyl Chloride & Copolymers Production	1,127	59	-1,068	-95%
Portland Cement Manufacturing	9,691	4,143	-5,548	-57%
Primary Aluminum Production	4,069	4,829	760	19%
Primary Copper Smelting	157	37	-120	-76%
Primary Lead Smelting	297	60	-237	-80%
Primary Magnesium Refining	37,535	7,385	-30,150	-80%
Printing, Coating & Dyeing Of Fabrics	16,065	4,562	-11,503	-72%
Printing/Publishing (Surface Coating)	35,860	11,089	-24,771	-69%
Publicly Owned Treatment Works	8,119	12,031	3,912	48%
Pulp and Paper (Combustion) MACT II	56,922	35,637	-21,285	-37%
Pulp & Paper (non-combustion), MACT I and III	247,777	22,971	-224,806	-91%
Reciprocating Internal Combustion Engines (RICE)	28,484	8,294	-20,190	-71%
Refractory Products Manufacturing	238	78	-160	-67%
Reinforced Plastic Composites Production	14,814	3,730	-11,084	-75%

MACT Source Category	1990 NEI (tons per year)	2002 NEI Version 3 (tons per year)	Change (2002-1990) (tons per year)	Percent Change (2002-1990)
Rubber Tire Production	2,766	1,247	-1,519	-55%
Secondary Aluminum Production	21,860	2,688	-19,172	-88%
Secondary Lead Smelting	2,116	951	-1,165	-55%
Semiconductor Manufacturing	1,915	389	-1,526	-80%
Shipbuilding & Ship Repair (Surface Coating)	3,462	1,455	-2,007	-58%
Site Remediation	28	186	158	564%
Solvent Extraction for Vegetable Oil Production	25,549	16,270	-9,279	-36%
Stationary Combustion Turbines	550	1,294	744	135%
Steel Pickling - HCL Process	3,316	1,038	-2,278	-69%
Synthetic Organic Chemical Manufacturing (Hazardous Organic NESHAP)	546,063	12,264	-533,799	-98%
Taconite Iron Ore Processing	0	133	133	443233%
Viscose Process Manufacturing	3,216	2,477	-739	-23%
Wet-Formed Fiberglass Mat Production	322	51	-271	-84%
Wood Building Products (Surface Coating)	12,203	2,790	-9,413	-77%
Wood Furniture (Surface Coating)	24,403	10,128	-14,275	-58%
Wool Fiberglass Manufacturing	6,665	2,302	-4,363	-65%
Totals	**2,373,604**	**709,280**	**-1,664,324**	**70%**

Source: Data extracted from NEI databases

NEI Emissions Reductions Compared to Federal Register Anticipated Reductions

MACT Category	Federal Register Baseline (tons per year)	Federal Register Anticipated Reduction (tons per year)	Percent Federal Register Anticipated Reduction	1990 NEI (tons per year)	2002 NEI Version 3 (tons per year)	NEI Change (2002-1990) (tons per year)	Percent NEI Change (2002-1990)	Anticipated Emissions Reduction Achieved [a]
Aerospace Industries	209,661	123,700	59%	209,666	2,305	207,361	-99%	Yes
Chromium Electroplating	175	174	99%	184	5	179	-97%	No
Coke Ovens: Charging, Top Side, and Door Leaks	1,830	1,532	84%	2,214	64	2,150	-97%	Yes
Commercial Sterilization Facilities	1,188	1,140	96%	308	46	-262	-85%	No
Dry Cleaning Facilities: Perchloroethylene	46,500	25,800	55%	77,698	22,117	-55,581	-72%	Yes
Ferroalloys Production	NA	0	0%	714	293	-421	-59%	Yes
Flexible Polyurethane Foam Production	19,924	13,800	69%	16,335	2,589	-13,746	-84%	Yes
Gasoline Distribution (Stage I)	50,706	2,866	6%	33,241	80,028	46,786	141%	No
Halogenated Solvent Cleaners	135,397	853,000	63%	137,982	39,451	-98,531	-71%	Yes
Industrial Cooling Towers	25	25	99%	NA	2.5	NA	NA	NA
Magnetic Tape (Surface Coating)	4,470	2,300	51%	4,478	434	-4,044	-90%	Yes
Marine Vessel Loading Operations	NA	4,565	NA	7,449	216	-7,233	-97%	NA
Off-Site Waste and Recovery Operations	57,320	47,000	82%	435	17	-418	-96%	Yes
Petroleum Refineries	89,618	52,911	59%	101,305	8,717	-92,588	-91%	Yes
Pharmaceutical Production	36,923	24,000	65%	40,958	2,458	-38,500	-94%	Yes
Polymers & Resins I [b]	14,618	7,046	48%	26,248	4,763	-21,485	-82%	NA
Polymers & Resins II	135	105	78%	NA	NA	NA	NA	NA
Polymers & Resins IV	19,974	3,880	81%	4,008	730	-3,278	-82%	Yes
Primary Aluminum Production [c]	11,000	5,500	50%	3,178	1,832	1,346	42%	No
Primary Lead Smelting	NA	0	0%	297	60	-237	-80%	Yes

MACT Category	Federal Register Baseline (tons per year)	Federal Register Anticipated Reduction (tons per year)	Percent Federal Register Anticipated Reduction	1990 NEI (tons per year)	2002 NEI Version 3 (tons per year)	NEI Change (2002-1990) (tons per year)	Percent NEI Change (2002-1990)	Anticipated Emissions Reduction Achieved [a]
Printing/Publishing (Surface Coating)	23,871	7,400	31%	35,848	11,088	-24,760	-69%	Yes
Pulp & Paper Production (Subpart S)	264,555	153,221	58%	247,777	22,971	-224,806	-90%	Yes
Secondary Lead Smelting	2,106	1,411	67%	2,116	862	-1,253	-59%	No
Shipbuilding & Ship Repair (Surface Coating)	1,497	350	23%	3,462	1,353	-2,109	-61%	Yes
Steel Pickling - HCL Process	3,289	2,500	76%	3,316	1,038	-2,278	-69%	No
Synthetic Organic Chemical Manufacturing (Hazardous Organic NESHAP)	573,202	510,000	89%	546,063	12,260	-533,803	-98%	Yes
Wood Furniture (Surface Coating)	NA	32,795	NA	24,400	10,116	-14,285	-59%	NA

[a] Achievement of the anticipated emissions reduction is based on comparison of NEI percentage reduction to Federal Register percentage reduction.

[b] The 1900 and 2002 NEI totals for this MACT include both Polymers and Resins I and II. This is because the emissions for these 2 MACTS cannot be separated in the 1990 NEI.

[c] The Federal Register baseline and anticipated reduction figures for the Primary Aluminum MACT include only emissions of POM and Hydrogen Fluoride. In order to compare the anticipated emissions reductions for this MACT to the NEI emissions changes, we included only POM and Hydrogen Fluoride emissions in the NEI figures in this table. POM emissions from the NEI were determined by summing emissions of POM as PAH-7 and POM as PAH-15.

NA Data not available to make a determination.

Source: Developed by OIG staff from Federal Register notices, EPA rule development documents, and 1990 and 2002 NEI databases

Detailed Results - Petroleum Refinery MACT

Petroleum refining is a complex process involving the physical, thermal, and chemical separation of crude oil into its major components, which are further processed into a variety of finished petroleum products. Petroleum products represent the single largest source of energy for the United States, and include gasoline, jet fuel, home heating oil, and kerosene. According to the Energy Information Administration, as of November 2006, 142 refineries were operating in the United States. Refineries are located throughout the United States. The State with the largest number of refineries is Texas, followed by California and Louisiana. Each refinery can have thousands of possible emission points.

The 1995 Petroleum Refinery MACT (Subpart C) controls air toxics emissions from several different emission points, including process vents, storage vessels, wastewater streams, gasoline loading racks, marine tank vessel loading, and equipment leaks. The MACT incorporates other standards, including the 1989 Benzene National Emission Standards for Hazardous Air Pollutants (NESHAP)[17] and the 1994 regulation for fugitive emissions at certain MACT sources,[18] often referred to as Leak Detection and Repair (LDAR). The MACT standard targets 10 primary air toxics emitted by refineries, including 2,2,4-trimethylpentane, benzene, cresols, ethylbenzene, hexane, methyl tert butyl ether, naphthalene, phenol, toluene, and xylenes. Facilities were to be in full compliance with the Petroleum Refinery MACT by August 18, 1998.

Aggregate and Targeted Air Toxics for the Petroleum Refining Industry Decreased Dramatically

According to the NEI, air toxics emissions from petroleum refineries decreased dramatically between 1990 and 2002. Total emissions of air toxics decreased from 101,305 tons in 1990 to 8,717 tons in 2002, a reduction of 91 percent. This exceeds the total air toxics emissions reductions that EPA anticipated when the MACT was developed in 1995. EPA anticipated the standard would reduce total air toxics emissions from the industry by 59 percent.

Emissions of all the individual air toxics specifically targeted by the MACT standard also decreased significantly between 1990 and 2002. For example, emissions of benzene decreased from 6,762 tons in 1990 to 861 tons in 2002, a reduction of 87.3 percent. Table D-1 shows the 1990 and 2002 NEI emissions figures for each of the targeted air toxics for the Petroleum Refinery MACT.

[17] 40 Code of Federal Regulations (CFR) 61 Subpart FF
[18] 40 CFR 63 Subpart H

Table D-1: Emissions of Targeted Air Toxics for the Petroleum Refinery MACT

Targeted Air Toxics [a]	1990 NEI [b]	2002 NEI Version 3 [b]	Change [b] (2002-1990)	Percent Change
2,2,4-Trimethylpentane	23,589.0	138.9	-23,450.1	-99.4%
Benzene	6,762.0	861.3	-5,900.7	-87.3%
Cresol	513.5	13.1	-500.4	-97.5%
Ethylbenzene	3,482.4	280.7	-3,201.7	-91.9%
Hexane	24,804.4	1,174.1	-23,630.3	-95.3%
Methyl Tert Butyl Ether	3,605.3	427.5	-3,177.8	-88.1%
Naphthalene	796.1	69.1	-727.0	-91.3%
Phenol	216.5	31.2	-185.3	-85.6%
Toluene	15,394.8	1,848.7	-13,546.1	-88.0%
Xylenes (Mixed Isomers)	13,911.0	1,615.5	-12,295.5	-88.4%
Total	**93,075.0**	**6,460.1**	**-86,614.9**	**-93.1%**

[a] Primary air toxics targeted by the Petroleum Refinery MACT per the Federal Register.
[b] Tons per year.

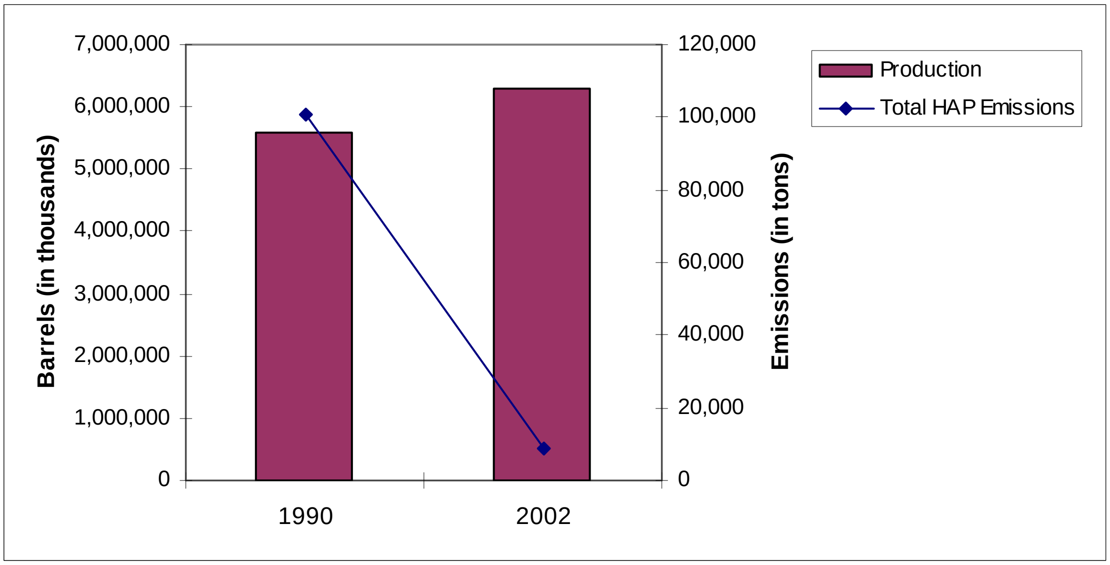
Source: Developed by OIG staff from NEI data

The decrease in emissions of total air toxics and targeted air toxics in the petroleum refining industry coincides with the implementation of the MACT standard. The compliance date of the MACT was August 18, 1998. Thus, based on the NEI data, it appears that the MACT has been effective in reducing emissions in the industry. However, it is not possible to determine from this analysis if the decreases in emissions were due only to the MACT standard. Other external factors, such as industry trends or other regulations, may have also impacted emissions at petroleum refineries.

Petroleum Refinery Emissions Decreased Despite Increase in Industry Production and Capacity

Air toxics emissions from petroleum refineries decreased significantly between 1990 and 2002, despite an increase in industry production over the same time period. According to the Energy Information Administration, net U.S. production of crude oil and petroleum products increased by 13.1 percent over this period, from approximately 5.6 billion barrels in 1990 to about 6.3 billion barrels in 2002.

Figure D-1: Comparison of Industry Production to Total Air Toxics Emissions



Source: Developed by OIG staff based on data from NEI and the Energy Information Administration

Similarly, total capacity in the refining industry increased between 1990 and 2002. According to the Energy Information Administration, crude oil distillation capacity at operating U.S. refineries increased by 7.3 percent, from about 15.1 millions barrels per day in 1990 to about 16.2 million barrels per day in 2002. At the same time, the number of operating refineries in the Unites States decreased, from 194 in 1990 to 144 in 2002. Thus, while the total number of U.S. refineries decreased, the average capacity at individual refineries has increased. According to the Energy Information Administration, capacity per operating refinery increased by 28 percent from 1990 to 1998.

Emissions are generally expected to increase as production and capacity increase. However, the opposite has occurred for the petroleum refining industry – emissions of aggregate and targeted air toxics have decreased dramatically, while total production and capacity levels in the industry increased. Thus, the decreases in emissions from petroleum refineries cannot be explained by industry trends in production or capacity.

Other Clean Air Act Regulations May Have Impacted Air Toxics Emissions from Refineries

The refining industry is subject to a number of CAA requirements other than the Petroleum Refinery MACT, and these requirements may have impacted air toxics emissions at refineries. These regulations include New Source Performance Standards, Prevention of Significant Deterioration/New Source Review, reformulated gasoline rules, and other MACT standards.

An industry association regulatory analyst told us that, depending upon its operation and configuration, a refinery could be subject to more than 15 different MACT standards, including the Hazardous Organic NESHAP, the Miscellaneous Organic NESHAP, and the Cooling Towers MACT. Representatives of two of the refineries we contacted said they are subject to the

Hazardous Organic NESHAP as well as the Petroleum Refinery MACT, and that the Hazardous Organic NESHAP has had an impact on emissions at the facility.

The National Petroleum Refinery Initiative Is Expected to Reduce Benzene and Volatile Organic Compound (VOC) Emissions

EPA's National Petroleum Refinery Initiative is an integrated compliance and enforcement strategy to address air emissions from the petroleum refining industry. The Refinery Initiative is focused on the four most significant CAA compliance issues for the industry: New Source Review/Prevention of Significant Deterioration; Flaring/New Source Performance Standards; LDAR; and the Benzene NESHAP. The Refinery Initiative does not focus directly on the Petroleum Refinery MACT standard. However, LDAR and the Benzene NESHAP are incorporated into the MACT standard; in order to comply with the Petroleum Refinery MACT, facilities must also comply with these standards.

Since March 2000, EPA has entered into 17 consent decree settlements with U.S. companies that refine nearly 77 percent of the nation's petroleum. These settlements cover 85 refineries in 25 States and, when fully implemented, should result in annual emissions reductions of approximately 80,000 tons of nitrogen oxides and approximately 235,000 tons of sulfur dioxide. The consent decrees are expected to result in reductions of fugitive emissions of VOCs, including benzene. It is uncertain if any reductions in benzene emissions resulting from the Initiative are reflected in the 2002 NEI figures. Over half of the affected refining capacity was not yet covered under the settlements in 2002.

Two of three refineries we contacted have entered into consent decrees with EPA under the Refinery Initiative. The third refinery has a consent decree with EPA covering similar issues, but a refinery official told us that it is separate from the National Refinery Initiative. The consent decrees for all three of these facilities address LDAR, and officials from two of the facilities told us that enhanced LDAR activities have reduced emissions from their facilities. For example, one facility representative told us that the consent decree reduced the leak level for which repairs are required from 10,000 parts per million to 500 parts per million. This has led to a reduction in fugitive emissions, which the representative told us is reflected in the facility's TRI figures for 2005.

Results for Sample Facilities

We selected three petroleum refineries for more in-depth review of emission changes, actions taken to comply with the MACT, external factors impacting emissions, compliance and enforcement activities, and use of compliance assistance tools. We selected these facilities based on the highest reported emissions of benzene from the 2002 NEI Version 1. We selected benzene because EPA considers it to be the air toxic posing the largest potential risk from the refining industry. Since these facilities were not randomly selected, the experiences of these facilities, as described below, may not be representative of the industry as a whole.

EPA revised the 2002 NEI after we selected our sample facilities and after we had conducted the majority of our field work. We updated our analyses to reflect the revised NEI emissions (i.e., Version 3) as described in the following sections.

Facility A

Facility A is one of the largest refineries in the United States, ranking in the top 10 percent in terms of capacity. As of January 2006, Facility A had an operating capacity of almost 290,000 barrels per day. The refinery is located on the Gulf of Mexico, and its primary products are low sulfur gasoline, diesel fuel, and jet fuel. An environmental engineer from Facility A told us that the refinery is located in an area that was designated as non-attainment in the 1980s under the National Ambient Air Quality Standards for ozone. As a result, the facility already had significant controls in place when the MACT was implemented, and did not have to make a large number of changes to some of the refinery's processes. The engineer told us that in order to comply with the MACT, the facility added controls to its truck racks, which were undergoing an expansion, and upgraded controls on its storage tanks. It also expanded and upgraded its LDAR controls and made adjustments to its startup, shutdown, and malfunction plan.

This facility's NEI Version 3 emissions show a decrease in emissions from 1990 to 2002 for 9 of the 10 air toxics targeted by the Petroleum Refinery MACT. Reported decreases in the 9 pollutants ranged from about 15 percent to 98 percent,[19] with emissions of 8 of the 10 targeted air toxics reduced by more than 50 percent. We were unable to determine if emissions of 2,2,4-Trimethylpentane decreased due to missing data in the 2002 NEI. This facility's updated 2002 NEI Version 3 emissions are relatively consistent with the facility's TRI-reported emissions. Benzene emissions do not show a marked decrease from 1990 levels. According to a facility engineer, the refinery made expansions in the mid-1990s that involved benzene sources. He also told us that after 2001, the refinery began identifying and reporting more leaks under LDAR, which includes benzene emissions.

The following table shows 1990 NEI, 2002 NEI (Versions 1 and 3), and 2002 TRI-reported emissions for all targeted pollutants.

[19] 1990 NEI compared to 2002 NEI Version 3.

Table D-2: Emissions of Targeted Air Toxics for Facility A[20]

Targeted Air Toxic [a]	1990 NEI [b]	2002 NEI Version 1 [b]	2002 NEI Version 3 [b]	Percent Reduction [f]	2002 TRI [b]
2,2,4-Trimethylpentane	204.3	NA	NA		NA
Benzene	54.4	55.8	46.4	14.7%	44.0
Cresol [c]	4.6	0.1	0.1	97.8%	0.1
Ethylbenzene	27.7	11.5	10.0	63.9%	10.7
Hexane [d]	214.8	11.7	8.0	96.3%	6.8
Methyl Tert Butyl Ether	28.6	20.6	13.9	51.4%	10.6
Naphthalene	6.8	1.0	0.8	88.2%	0.8
Phenol	1.7	0.2	0.1	94.1%	0.2
Toluene	127.0	35.0	29.2	77.0%	30.8
Xylenes [e]	195.6	178.3	130.3	33.4%	44.5

[a] Primary air toxics targeted by the Petroleum Refinery MACT per the Federal Register.
[b] Tons per year.
[c] TRI amount represents Cresols (Mixed Isomers).
[d] TRI amount represents n-Hexane.
[e] TRI amount represents Xylenes (Mixed Isomers).
[f] 1990 NEI compared to 2002 NEI Version 3.
NA= Reported emissions not available for this air toxic.

Source: Developed by OIG staff from NEI and TRI databases

Facility B

Facility B is a mid-sized refinery with a capacity of about 112,000 barrels per day. It is located in the Midwest, and its primary products include gasoline and diesel fuels. The facility was purchased out of bankruptcy by the current owners in 2004. Officials from the facility told us they were not employed by the refinery at the time the Petroleum Refinery MACT standard was implemented. Based on facility records and discussions with other employees, they believe the previous owners took several actions to comply with the MACT. These actions included:

- Rebuilding the loading rack and installing vapor controls;
- Adding a flare to the coker, and modifying a number of atmospheric vents so that emissions were treated and sent to the coker flare;
- Increasing LDAR monitoring; and
- Stopping the discharge of slop oil into the sewer, which resulted in a significant drop in air toxics emissions.

The facility's NEI emissions data show that 2 of the 10 targeted air toxics increased from 1990 to 2002, while 5 of the 10 decreased. Data for 3 of the 10 targeted air toxics are missing and thus we were unable to determine if emissions decreased for these pollutants. Benzene emissions increased slightly during this period, and hexane emissions increased by over 47 percent. Refinery officials attributed the increase in these pollutants to an increase in production at the facility in 1998. For the 5 targeted air toxics showing emissions decreases, reductions ranged from about 83 percent to 99 percent. The refinery official attributed this overall decrease to a

[20] The name of Facility A changed between the 1990 and 2002 NEI. We included emissions only from those records that matched according to the State Facility Identification or the Federal Registry Identification in the different inventories.

combination of factors, including permitting, offsets to avoid triggering Prevention of Significant Deterioration requirements, and the MACT standard.

The following table shows 1990 NEI, 2002 NEI (Versions 1 and 3), and 2002 TRI-reported emissions for all targeted pollutants.

Table D-3: Emissions of Targeted Air Toxics for Facility B

Targeted Air Toxic [a]	1990 NEI [b]	2002 NEI Version 1 [b]	2002 NEI Version 3 [b]	Percent Reduction [e]	2002 TRI [b]
2,2,4-Trimethylpentane	97.4	0.8	0.8	99.2%	NA
Benzene	25.9	26.1	26.1	**(+ .8%)**	26.2
Cresol	NA	NA	NA		NA
Ethylbenzene	13.2	0.1	0.1	99.2%	0.1
Hexane [c]	102.4	150.9	150.9	**(+ 47.4%)**	157.5
Methyl Tert Butyl Ether	13.7	NA	NA		NA
Naphthalene	3.2	0.1	0.1	96.9%	NA
Phenol	0.8	NA	NA		NA
Toluene	60.5	6.3	6.3	89.6%	6.3
Xylenes [d]	51.4	16.7	8.7	83.1%	8.7

[a] Primary air toxics targeted by the Petroleum Refinery MACT per the Federal Register.
[b] Tons per year.
[c] TRI amount represents n-Hexane.
[d] TRI amount represents Xylenes (Mixed Isomers).
[e] 1990 NEI compared to 2002 NEI Version 3.
NA = Reported emissions not available for this air toxic.

Source: Developed by OIG staff from NEI and TRI databases

Facility C

Facility C is one of the largest refineries in the United States, ranking in the top 10 percent in terms of capacity. As of January 2006, Facility C had an operating capacity of 330,000 barrels per day. The refinery is located on the Gulf of Mexico, and its primary products are gasoline, jet fuel, and diesel fuel.

Officials from Facility C told us they took a number of actions in order to comply with the Petroleum Refinery MACT standard. These actions included:

- Installing seals on their floating roof racks;
- Adding a water scrubber to a process vent;
- Installing closed loop sampling systems;
- Implementing LDAR requirements at a number of emission units; and
- Installing a lean absorption system to comply with the Marine Vessel Loading MACT (Subpart Y), which is incorporated into the Petroleum Refinery MACT.

According to the NEI, emissions of 9 of the 10 air toxics targeted by the MACT decreased between 1990 and 2002. We were unable to determine if emissions of cresol decreased because of missing data. Benzene emissions from Facility C decreased significantly between 1990 and 2002, from 128.4 tons to 37.1 tons (about 71 percent). Reductions for the other air toxics targeted by the MACT ranged from about 1 percent to nearly 100 percent. Emissions of eight of the targeted air toxics decreased by more than 50 percent.

However, it is possible that emissions decreased even more than is indicated by the NEI since the NEI emissions for 2002 are based on the facility's potential to emit (i.e., the maximum level of emissions the facility could emit) for that year, rather than actual emissions. State agency staff who provided the NEI emissions data to EPA told us that they did not have the facility's actual emissions data for 2002. Instead, they reported the facility's potential to emit. The facility's 2002 TRI-reported emissions were considerably lower than the 2002 NEI emissions for the targeted air toxics we compared.

The following table shows 1990 NEI, 2002 NEI (Versions 1 and 3), and 2002 TRI-reported emissions for all targeted pollutants.

Table D-4: Emissions of Targeted Air Toxics for Facility C

Targeted Air Toxic [a]	1990 NEI [b]	2002 NEI Version 1 [b]	2002 NEI Version 3 [b]	Percent Reduction [e]	2002 TRI [b]
2,2,4-Trimethylpentane	482.2	2.3	2.3	99.5%	NA
Benzene	128.4	37.1	37.1	71.1%	27.0
Cresol	NA	0.0	0.0	57.9%	0.0
Ethylbenzene	65.3	27.5	27.5	37.8%	8.8
Hexane[c]	507.0	90.5	90.5	82.1%	52.5
Methyl Tert Butyl Ether	67.6	4.8	4.8	92.9%	NA
Naphthalene	16.0	2.1	2.1	86.9%	1.7
Phenol	4.0	0.0	0.0	100.0%	0.0
Toluene	299.7	122.2	122.2	59.2%	43.5
Xylenes[d]	492.1	488.9	488.9	0.7%	103.4

[a] Primary air toxics targeted by the Petroleum Refinery MACT per the Federal Register.
[b] Tons per year.
[c] TRI amount represents n-Hexane.
[d] TRI amount represents sum of m-Xylene, o-Xylene, and p-Xylene.
[e] 1990 NEI compared to 2002 NEI Version 3.
NA = Reported emissions not available for this air toxic.

Source: Developed by OIG staff from NEI and TRI databases

Detailed Results - Primary Aluminum MACT

The United States aluminum supply is comprised of three basic sources:

- Primary aluminum (domestic production from ore material);
- Imported aluminum (of primary and secondary ingot and mill products); and
- Recycled aluminum (metal recovered from scrap, also known as secondary recovery).

Companies in the primary aluminum industry are primarily engaged in making aluminum from alumina. Alumina is refined from bauxite ore. The companies in this industry may also roll, draw, extrude, or cast the aluminum they make into primary forms. These forms can be bars, billets, ingots, plates, rods, sheets, or strip. Companies in this industry may make primary aluminum or aluminum-based alloys from alumina.

The intent of the 1997 Primary Aluminum MACT was to reduce emissions of the two targeted air toxics, hydrogen fluoride and POM. Facilities were expected to be in compliance by October 7, 1999. The MACT added extensive monitoring and reporting requirements. Monitoring requirements included:

- Monthly measurements of total fluorides secondary emissions (unless one obtains a monitoring alternative) with annual measurements of primary emissions;
- Quarterly measurements of POM secondary emissions from each Soderberg potline with annual measurements of primary emissions;
- Continuous parameter monitoring system (e.g., scrubber air flow rate, dry alumna flow rate, water flow rate, voltage, etc.) for each emission control device; and
- Monitoring device(s) to determine the daily weight of aluminum produced.

Reporting requirements included:

- Start-up, shutdowns, and malfunctions reports;
- Annual reports on performance tests done after the initial performance test; and
- Semi-annual excess emissions reports.

Aggregate and Targeted Air Toxics for the Primary Aluminum Industry Decreased Between 1990 and 2002

NEI data indicates that hydrogen fluoride and two subcategories of POM (PAH 7 and PAH 15) emissions declined for this MACT sector between 1990 and 2002. Hydrogen fluoride emissions decreased by 27.6 percent. PAH 15 emissions decreased by 91.4 percent, and PAH 7 emissions declined by 94.5 percent. For hydrogen fluoride, this is less than the reduction EPA estimated for total fluorides when it issued the Primary Aluminum MACT standards. EPA had estimated that total fluoride emissions would decrease by 46 percent. EPA estimated an approximately 91 percent decrease in POMs, which includes PAH 15 and PAH 7.[21]

Table E-1: NEI Emissions of Targeted Air Toxics for the Primary Aluminum MACT

Targeted Air Toxic [a]	1990 NEI [b]	2002 NEI Version 3 [b]	Change (2002-1990) [b]	Percent Change [b]
Hydrogen Fluoride	2,476.00	1,792.30	-683.7	-28%
PAH [c] 15	427.5	36.7	-390.7	-91%
PAH [c] 7	274.2	15.3	-258.9	-94%
Totals	**2,903.5**	**1,829.0**	**1,074.50**	**-37%**

[a] Primary air toxics targeted by the MACT per the Federal Register.
[b] Tons per year.
[c] Polycyclic aromatic hydrocarbons.
[d] Total represents the sum of Hydrogen Fluoride and PAH 15 since PAH 7 is a subset of PAH 15.

Source: Developed by OIG staff from NEI databases

Decreases in Production and Changes in Emission Reporting Impact Emission Trends

Two unrelated factors should be considered in analyzing emission trends for the primary aluminum industry. First, there was a decline in U.S. capacity and production, which would be expected to cause industry-wide emissions to decrease. Second, industry representatives told us that the methodology used to estimate emissions for TRI reporting was revised after the MACT implementation date in 1999 because company officials realized they could provide more accurate emissions data. Company representatives told us that prior to the implementation of the Primary Aluminum MACT, their company relied on emissions factors to estimate emissions. Following the implementation of the MACT, more reliable monitoring became available. The representatives told us that they discovered that the use of the emissions factors resulted in the underreporting of emissions. A change in methodology to estimate emissions complicates analyzing emissions trends. We do not know the extent to which reliable methodologies were used to develop a facility's emissions total in the NEI. EPA representatives told us that the NEI does not always identify the methodology used to calculate the amount of emissions. If a less reliable methodology, such as an emission factor, is still being used in the current NEI, it could result in underreporting of emissions.

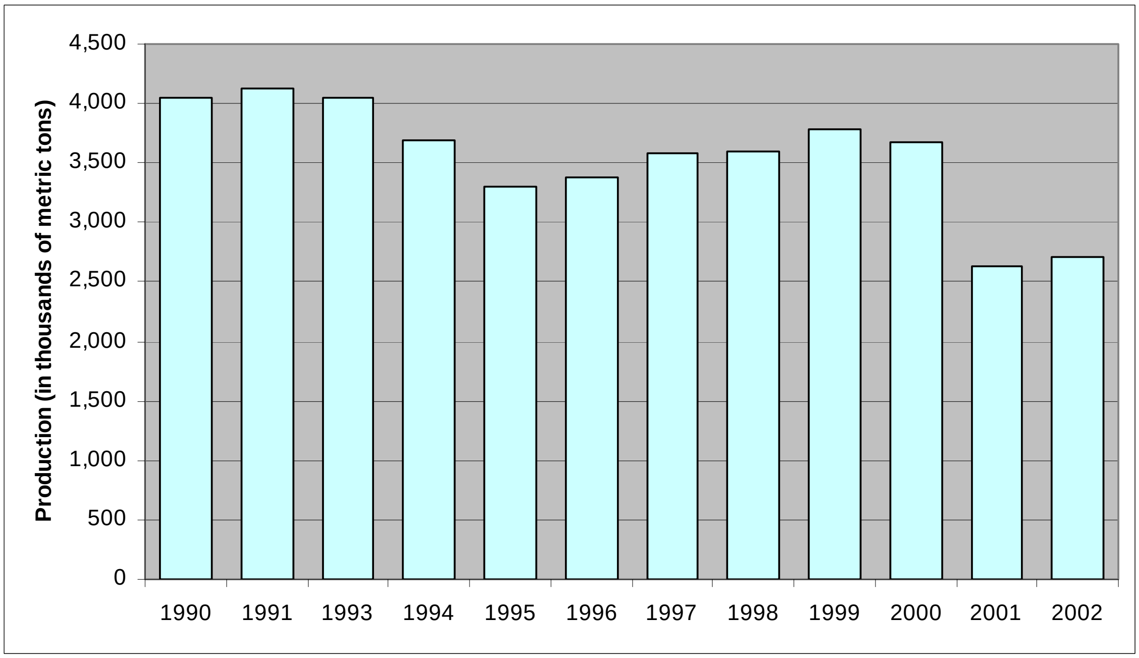
Downward Trend in Capacity and Production in the Industry

The primary aluminum industry is subject to world markets, and United States production has decreased between 1990 and 2002. According to the Vice President for Environmental Health and Safety of the Aluminum Association, there has been a "dramatic downward trend" in U.S. capacity and production in the industry. Primary aluminum production decreased 33.1 percent from 1990 and 2002. Between 1999, the compliance date of the MACT, and 2002, industry wide U.S. production decreased by 27.1 percent.

[21] The Federal Register Notice for the Primary Aluminum MACT identified a 50-percent reduction in HAPs from 11,000 tons per year to 5,500 tons per year. EPA's estimated HAPs and reductions are significantly more than the emissions in the NEI for 1990 and 2002.

These decreases in production are influenced by rising energy costs, particularly in the Northwest, where some facilities have shut down. Since the compliance date of the MACT in 1999, several facilities have closed temporarily or permanently. According to the U.S. Geological Survey, in 1999, 23 primary aluminum facilities were in operation. In contrast, in 2002, 16 primary aluminum plants were in operation, and 7 were temporarily or permanently idled. At the end of 2002, about 1.5 million metric tons per year of domestic primary smelting capacity, equivalent to 35 percent of total capacity, was closed.

Figure E-1: Primary Aluminum Production in the United States, 1990 - 2002



Source: Developed by OIG staff from U.S. Geological Survey data

Improved Emission Estimates

Improvements in the methodology for estimating emissions have impacted reported emissions trends since the MACT compliance date. Prior to implementation of the MACT, industry facilities used emissions factors to estimate the amount of air toxics emitted by their facilities and reported in the TRI. However, the MACT required facilities to conduct self-monitoring and reporting. This additional monitoring resulted in companies obtaining more accurate information about their emissions. Representatives from two of the three facilities we contacted told us that they revised their methodology for reporting emissions after the MACT was implemented. They told us that the revised methodology resulted in higher reported emissions than what they had reported under the prior methodology.

Results for Sample Facilities

We selected the three facilities with the largest reported emissions of POM in the 2002 NEI (Version 1) for review. Since these facilities were not randomly selected their experiences may not be representative of the industry as a whole. In particular, production at two of these facilities increased while production for the industry overall has decreased. Further, NEI and

TRI data show an increase in hydrogen fluoride emissions for each of these three facilities. This is contrary to overall industry trends, which indicate an overall decrease in hydrogen fluoride emissions.

EPA revised the NEI after we selected our sample facilities, and had conducted the majority of our field work. We updated our analyses to reflect the revised NEI emissions (i.e., Version 3). However, the changes from Version 1 to Version 3 were minor and were not noticeable when the data was converted from pounds to tons.

Facility D

Facility D is an aluminum reduction plant built in 1979. Company officials told us they have been operating at or near capacity since 1999. Further, this facility was one of the best performing facilities in terms of emission rates when the MACT was developed. Thus, this facility's emission rates were used to establish the MACT floor for the entire industry. In response to the MACT, the facility took steps to meet industrial ventilation criteria, installed parametric monitors to conduct continuous monitoring, added computers for data collection and reporting systems, and updated inspection practices.

According to the NEI Version 3 data, hydrogen fluoride emissions increased from 20.4 to 63.3 tons per year (210.3 percent) between 1990 and 2002 for this facility. PAH-15 emissions decreased from 5.4 to 3.5 tons per year (35.2 percent) during the same time period. We also compared the facility's 2002 NEI emissions to the facility's 2002 TRI self-reported emissions. The TRI-reported emissions for hydrogen fluoride were close to the number reported in NEI.

Company officials could not explain the increase in EPA's NEI emissions for hydrogen fluoride since they did not know how the NEI numbers were developed. We were unable to determine how the NEI emissions were developed. An Agency official noted problems with the accuracy of the 1990 NEI. The company officials told us that their TRI-reported emissions have remained constant from 1997 through 2004. They told us that even though facility production has increased, reported emissions have remained constant. Thus, the facility's emission rate for hydrogen fluoride (amount of emissions per unit of production) has decreased. Company officials told us that, in their opinion, the MACT has resulted in emissions reductions for the industry, particularly at the older facilities.

The following table shows 1990 NEI, 2002 NEI (Versions 1 and 3), and 2002 TRI-reported emissions for all targeted pollutants.

Table E-2: Emissions of Targeted Air Toxics for Facility D

Targeted Air Toxics [a]	1990 NEI [b]	2002 NEI Version 1 [b]	2002 NEI Version 3 [b]	Percent Reduction [d]	2002 TRI [b]
PAH [c] 15	5.4	3.5	3.5	35.2%	NA
PAH [c] 7	2.1	3.5	3.5	(+66.7%)	NA
Hydrogen fluoride	20.4	63.3	63.3	(+210.3%)	62.5
Totals [e]	**25.8**	**66.8**	**66.8**	(+158.9%)	**Not Applicable**

[a] Primary air toxics targeted by the MACT per the Federal Register.
[b] Tons per year.
[c] Polycyclic aromatic hydrocarbons.
[d] 1990 NEI compared to 2002 NEI Version 3.
[e] Total represents the sum of Hydrogen Fluoride and PAH 15 since PAH 7 is a subset of PAH 15.
NA = Emissions for this subcategory of polycyclic organic matter is not available in the TRI.

Source: Developed by OIG staff from NEI databases

Facility E

Facility E is an aluminum reduction plant built in 1957. According to facility representatives, they made several changes in response to the 1997 Primary Aluminum MACT. For example, they installed a pitch fume scrubber, started daily testing, and maintained daily logs. Facility representatives told us they switched from using pencil pitch to liquid pitch around 1999-2000 and this resulted in a substantial reduction in polycyclic aromatic compounds.[22] The change in pitch type reduced fugitive emissions.

This facility's hydrogen fluoride emissions increased from 74.7 to 119.2 tons per year (59.6 percent) between 1990 and 2002, according to the NEI, and the facility's PAH-15 emissions decreased from 20 to 8.4 tons per year (58 percent) between 1990 and 2002. We also compared the facility's 2002 NEI emissions to the facility's 2002 TRI self-reported emissions. The reported emissions for hydrogen fluoride were very similar in both databases.

Facility E representatives told us that the company changed the way TRI-reported emissions were calculated, resulting in higher emission estimates despite installing additional controls. Earlier, Facility E used AP-42 emissions factors to calculate its TRI emissions, but in 2001 changed to collecting actual emissions data from monitoring. They found that estimated emissions based on emissions factors were "a little bit lower" than emissions based on monitoring data. The company also reported confusion about reporting polycyclic aromatic compounds in the TRI. In their opinion, the MACT reduced emissions because it forced them to pay more attention to daily compliance and fugitive emissions.

The following table shows 1990 NEI, 2002 NEI (Versions 1 and 3), and 2002 TRI-reported emissions for all targeted pollutants.

[22] Polycyclic aromatic compounds include PAH 7 and PAH 15 and are reported in the TRI.

Table E-3: Emissions of Targeted Air Toxics for Facility E

Targeted Air Toxic [a]	1990 NEI	2002 NEI Version 1	2002 NEI Version 3	Percent Reduction[d]	2002 TRI
PAH [c] 15	20	8.4	8.4	58.0%	NA
PAH [c] 7	7.8	8.4	8.4	(+7.7%)	NA
Hydrogen fluoride	74.7	119.2	119.2	(+59.6%)	119.3
Totals [e]	94.7	127.6	127.6	(+34.7%)	**Not Applicable**

[a] Primary air toxics targeted by the MACT per the Federal Register.
[b] Tons per year.
[c] Polycyclic aromatic hydrocarbons.
[d] 1990 NEI compared to 2002 NEI Version 3.
[e] Total represents the sum of Hydrogen Fluoride and PAH 15 since PAH 7 is a subset of PAH 15.
NA = Emissions for this subcategory of polycyclic organic matter is not available in the TRI.

Source: Developed by OIG staff from NEI and TRI databases

Facility F

Facility F is an aluminum reduction plant that started producing aluminum in 1971. According to facility officials, production at their plant has increased 14 percent since 1999. They told us that in response to the MACT, they (1) installed a scrubber on their carbon based oven, (2) modified bag houses, (3) and implemented monitoring methods.

Based on the NEI data, hydrogen fluoride emissions increased from 88.4 to 143.1 tons per year (61.9 percent) between 1990 and 2002. The facility's PAH-15 emissions decreased during this period from 23.6 to 6.8 tons per year (71.2 percent), according to NEI data. We also compared the facility's 2002 NEI emissions to the facility's TRI self-reported emissions. The TRI-reported emissions were slightly less than the amount in the NEI.

Facility F representatives told us that their method for reporting hydrogen fluoride emissions in TRI has improved since 1990. They are now using actual emissions testing data rather than emissions factors. These officials told us that emissions of hydrogen fluoride were underreported until they started using testing data to report emissions. They also noted that there was some confusion in the past regarding the reporting of polycyclic aromatic compound numbers. In their opinion, the MACT reduced emissions for this industry since the majority facilities within the industry had to make changes to come into compliance.

The following table shows 1990 NEI, 2002 NEI (Versions 1 and 3), and 2002 TRI-reported emissions for all targeted pollutants.

Table E-4: Emissions of Targeted Air Toxics for Facility F

Targeted Air Toxic [a]	1990 NEI [b]	2002 NEI [b]	2002 NEI Version 3 [b]	Percent Reduction [d]	2002 TRI [b]
PAH[c] 15	23.6	6.8	6.8	71.2%	NA
PAH[c] 7	9.2	6.8	6.8	26.1%	NA
Hydrogen fluoride	88.4	143.1	143.1	(+61.9%)	136.2
Totals [e]	112.0	149.9	149.9	71.2%	**Not Applicable**

[a] Primary air toxics targeted by the MACT per the Federal Register.
[b] Tons per year.
[c] Polycyclic aromatic hydrocarbons.
[d] 1990 NEI compared to 2002 NEI Version 3.
[e] Total represents the sum of Hydrogen Fluoride and PAH 15 since PAH 7 is a subset of PAH 15.
NA = Emissions for this subcategory of polycyclic organic matter is not available in the TRI.

Source: Developed by OIG staff from NEI and TRI databases

Detailed Results - Pulp and Paper MACT

The Pulp and Paper MACT category includes two types of mills: (1) mills that process raw wood fiber or recycled fiber to make pulp and/or paper; and (2) mills that convert pulp and paper into more specialized products such as paperboard boxes, writing paper, and sanitary paper. Pulp and paper production involves both combustion processes and non-combustion processes. The Pulp and Paper MACT (MACTs I and III)[23] apply to non-combustion sources of pulp and paper production. MACT I establishes controls for air toxics emissions from mills using the kraft, sulfite, semi-chemical, and soda pulping processes. MACT III establishes controls for air toxics emissions from mills using mechanical, secondary fiber, and non-wood pulping, and papermaking systems at all mills.

The 1998 Pulp and Paper MACT established separate emission limits for pulping system vents, pulping process condensate streams, and bleaching systems. MACT I and MACT III provide several alternative emission limits for the pulping vent standard, pulping condensates standard, and bleaching system standard. For each regulated emission point, a mill can choose the emission limit it will comply with and can use any emission control technology to achieve compliance. In general, mills must conduct an initial performance test and then continuously monitor a set of control devices or process operating parameters. Exceeding a monitoring parameter constitutes a violation of the standard. Mills must continuously monitor operating parameters and report all instances where the values deviate from the maximum or minimum values established during the initial performance test.

The Pulp and Paper MACT targets 13 air toxics that are included in EPA's list of the 33 highest priority air toxics. These include acetaldehyde, acrolein, carbon tetrachloride, chloroform, formaldehyde, and methylene chloride, among others. Formaldehyde is estimated to present the most risk to public health from the pulp and paper production industry.

NEI Data Shows Significant Decrease in Air Toxics Emissions

According to the NEI, from 1990 to 2002, air toxics emissions from pulp and paper facilities decreased from 213,652 tons to 21,455 tons (90 percent). When EPA developed the Pulp and Paper MACT it estimated that these standards would reduce emissions by 64 percent. Emissions for the 13 air toxics specifically targeted by the Pulp and Paper MACT have also decreased. The following table shows the emission changes for targeted pollutants from 1990 to 2002, based on the NEI.

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[23] MACT II (subpart MM) covers chemical production for the pulp and paper industry and had a compliance date in 2004. Our review did not include this MACT since we limited our review to those MACTs with compliance dates prior to 2002

Table F-1: NEI Emissions of Target Air Toxics for the Pulp and Paper MACT

Targeted Air Toxic [a]	1990 NEI [b]	2002 NEI Version 3 [b]	Change [b] (2002-1990)	Percent Change
1,2,4-Trichlorobenzene	5,710.0	74.6	5,635..4	-98.7%
Acetaldehyde	10,921.1	1,432.8	9,488.3	-86.9%
Acrolein	283.0	55.5	227.5	-80.4%
Carbon Tetrachloride	4,270.0	54.9	4,215.1	-98.7%
Chloroform	18,500.1	463.5	18,036.6	-97.5%
Cresol/Cresylic Acid (Mixed Isomers)	NA	NA		
Cumene	8,270.0	16.0	8,254.0	-99.8%
Formaldehyde	4,124.4	196.4	3,928.0	-95.2%
Methanol	152,292.9	18,959.3	133,333.6	-87.6%
Methylene Chloride (Dichloromethane)	1,740.0	79.6	1,660.4	-95.4%
Phenol	3,060.0	68.0	2,992.0	-97.8%
Propionaldehyde	2,040.0	11.1	2,028.9	-99.5%
Xylenes (Mixed Isomers)	2,440.0	43.3	2,396.7	-98.2%
Totals	213,651.5	21,455.0	192,196.5	-90.0%

[a] Primary air toxics targeted by the MACT per the Federal Register.
[b] Tons per year.

Source: Developed by OIG staff from NEI database

We did not determine the extent to which these emissions were attributed to the MACT rules. As explained below, decreases in production had an impact on overall emissions.

Decreases in Production May Have Impacted Overall Emissions

A decrease in U.S. production of paper and paperboard products was one possible reason for an overall decline in air toxics emissions from this industry. Between 1997 and 2000, U.S. exports of paper and paperboard products declined 5.5 percent, while imports increased 20 percent. Capital investments in recent years were well below historic levels, and no new mills have been built in the United States since 1970. For the first time, U.S. industry capacity declined in 2001.

Review of Sample Facilities

We selected the three facilities with the largest reported emissions of formaldehyde in the 2002 NEI (Version 1) for review. These three pulp and paper mills represent three industry components: pulp mills, paper mills, and paperboard mills. Since these facilities were not randomly selected, the experiences of these facilities may not be representative of the industry as a whole.

Pulp and Paper emissions were not affected by the update from NEI Version 1 to Version 3.

Facility G

Facility G is a paperboard mill. Facility G managers told us that changes in emission calculation methods and increases in production were two non-MACT related factors that impacted air toxics emissions. Facility G was granted a 1-year extension to comply with Phase 1 of the

MACT standard, resulting in a compliance date of April 16, 2002. Managers told us that Facility G made several changes to the mill to comply with the MACT. In 2001, Facility G installed a stream stripper, made improvements to its thermal oxidizer, and made minor improvements to the non-condensable gas collection system. In 2003, changes were made to the washer system to comply with Phase 2 of the MACT. Facility G used the Clean Condensate Alternative, shower water improvements and changes to the tanks and piping were made, and it began using cleaner water in the shower water system, which helped reduce the amount of methanol emissions in the wastewater.

According to the NEI, emissions of targeted air toxics decreased significantly for this facility from 1990 to 2002. We also compared the facility's 2002 NEI emissions to the facility's self-reported emissions in TRI. The TRI-reported emissions were greater for two pollutants: acetaldehyde and formaldehyde. However, NEI 2002 methanol emissions were greater than TRI-reported emission by more than 500 tons per year.

Facility G managers told us that they had made significant changes in their method for calculating TRI-reported emissions since 1999. Specifically, emissions factors for methanol and other air toxics have changed, and industry guidelines for calculating emissions have improved over the years making them more accurate. In their estimation, the majority of the emissions changes have resulted in decreased reported emissions, since the old emissions factors over-estimated emissions. However, any decreases in emissions at Facility G resulting from changes in emissions factors may have been offset by increases in production. The following table shows 1990 NEI, 2002 NEI (Versions 1 and 3), and 2002 TRI-reported emissions for all targeted pollutants.

Table F-2: Emissions of Targeted Air Toxics for Facility G

Targeted Air Toxic [a]	1990 NEI [b]	2002 NEI Version 1 [b]	2002 NEI Version 3 [b]	Percent Reduction [c]	2002 TRI [b]
1,2,4-Trichlorobenzene	176.2	8.2	8.2	95.3%	NA
Acetaldehyde	333.1	38.9	38.9	88.3%	49.9
Acrolein	8.6	4.0	4.0	53.5%	NA
Carbon Tetrachloride	130.2	12.1	12.1	90.7%	NA
Chloroform	563.9	10.4	10.4	98.2%	NA
Cumene	255.3	NA	NA		NA
Formaldehyde	125.8	17.1	17.1	86.4%	37.8
Methanol	4,691.7	1642.8	1642.8	65.0%	1,068.2
Methylene Chloride	53.0	4.1	4.1	92.3%	NA
O-Cresol	NA	NA	NA	NA	NA
Phenol	94.5	1.1	1.1	1.1	1.3
Propionaldehyde	63.0	NA	NA	NA	NA

[a] Primary air toxics targeted by the MACT per the Federal Register.
[b] Tons per year.
[c] 1990 NEI compared to 2002 NEI Version 3.
NA = Reported emissions not available for this air toxic.

Source: Developed by OIG staff from NEI and TRI databases

Facility H

Facility H is a paper and paperboard mill. Facility H managers told us they had to make process and control changes to comply with the MACT. Initially the stripper-off gas systems from the steam stripper were incinerated in the lime kiln. However, variability in the stripper-off gases thermal value caused swings in the lime kiln, which resulted in damage to the kiln. Facility H installed a methanol liquefaction system to condense the stripper-off gases and burn the methanol in the recovery boilers.

According to the NEI, emissions of targeted air toxics decreased significantly for this facility from 1990 to 2002. We also compared the facility's 2002 NEI emissions to the facility's TRI self-reported emissions. The 2002 emissions data from the NEI and TRI were very consistent for this facility. The following table shows 1990 NEI, 2002 NEI (Versions 1 and 3), and 2002 TRI-reported emissions for all targeted pollutants.

Table F-3: Emissions of Targeted Air Toxics for Facility H

Targeted Air Toxic [a]	1990 NEI [b c]	2002 NEI Version 1 [b c]	2002 NEI Version 3 [b c]	Percent Reduction [d]	2002 TRI [b]
1,2,4-Trichlorobenzene	94.5	3.3	3.3	96.5%	NA
Acetaldehyde	211.4	77.0	77.0	63.6%	77.0
Acrolein	4.6	3.5	3.5	23.9%	NA
Carbon Tetrachloride	69.8	0.1	0.1	99.9%	NA
Chloroform	302.4	NA	NA		NA
Cumene	136.9	0.5	0.5	99.6%	NA
Formaldehyde	67.4	14.8	14.8	78.0%	14.8
Methanol	2,731.4	892.9	892.9	67.3%	892.9
Methylene Chloride	28.4	NA	NA		NA
O-Cresol	NA	NA			NA
Phenol	50.6	3.6	3.6	92.9%	3.6
Propionaldehyde	33.8	0.2	0.2	99.4%	NA

[a] Primary air toxics targeted by the MACT per the Federal Register.
[b] Tons per year.
[c] The NEI emissions include totals from two different Pulp and Paper MACT codes: 1626-1 (subpart S) and 1626-2 (subpart M). In the 1990 NEI and the 2002 NEI Version 1, the majority of emissions for this facility were included in the 1626-1 code. However, in the 2002 NEI Version 3, the majority of emissions were included in the 1626-2 code. For this facility, we combined emissions from both codes in the NEI emissions figures.
[d] 1990 NEI compared to 2002 NEI Version 3.
NA= Reported emissions not available for this air toxic.

Source: Developed by OIG staff from NEI and TRI databases

Facility I

Facility I is a pulp mill that produces cellulose fibers. According to the NEI, emissions of targeted air toxics decreased significantly for this facility from 1990 to 2002. However, the data from the 2002 NEI appeared questionable since the reported emissions for three pollutants (acetaldehyde, formaldehyde, and methanol) were the same. Further, the NEI emissions were significantly lower than TRI reported emissions for two of the pollutants.

Despite repeated attempts, we were unable to schedule a meeting with representatives from this facility to discuss the MACT's impact on their facility's emissions. The following table shows 1990 NEI, 2002 NEI (Versions 1 and 3), and 2002 TRI-reported emissions for all targeted pollutants.

Table F-4: Emissions of Targeted Air Toxics for Facility I

Targeted Air Toxic [a]	1990 NEI [b]	2002 NEI Version 1 [b]	2002 NEI Version 3 [b]	Percent Reduction [d]	2002 TRI [b]
1,2,4-Trichlorobenzene	26.3	NA	NA		NA
Acetaldehyde	49.7	22.2	22.2	55.3%	53.2
Acrolein	1.3	NA	NA		NA
Carbon Tetrachloride	19.4	NA	NA		NA
Chloroform	84.1	NA	NA		NA
Cumene	38.1	NA	NA		NA
Formaldehyde	18.8	22.2	22.2	**(+18.1%)**	7.6
Methanol	700.0	22.2	22.2	96.8%	188.2
Methylene Chloride	7.9	22.2	22.2	**(+181.0%)**	NA
O-Cresol[c]	NA	NA	NA		19.7
Phenol	14.1	NA	NA		1.3
Propionaldehyde	9.4	NA	NA		NA

[a] Primary air toxics targeted by the MACT per the Federal Register.
[b] Tons per year.
[c] TRI amount represents Cresol (Mixed Isomers).
[d] 1990 NEI compared to 2002 NEI Version 3.
NA= Reported emissions not available for this air toxic.

Source: Developed by OIG staff from NEI and TRI databases

Appendix G

MACT Compliance Monitoring, Enforcement, and Compliance Assistance Activities

Our evaluation objectives included the following questions:

- Is there a relationship between the quantity and quality of compliance monitoring and enforcement and the effectiveness of MACT standards in achieving the desired emissions reductions?
- Is there a relationship between the adequacy of compliance assistance tools and the effectiveness of MACT standards in achieving the desired emissions reductions?

Limitations to the amount and quality of data regarding compliance monitoring and compliance assistance activities prevented us from quantitatively assessing the impact of these activities on MACT effectiveness. Instead we reviewed results from previous studies and initiatives, and discussed the impact of these activities on MACT effectiveness with representatives from selected facilities and States. The sections below discuss the results of our review.
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Results of Statistically Valid Compliance Rate Studies

We identified two statistically valid compliance rate studies that have been conducted for MACT industries, one by EPA and the other by the California Air Resources Board. Both of these studies found high noncompliance rates for their respective industries.

In Fiscal Year 2002, EPA conducted a statistically valid study of compliance with the Ethylene Oxide Sterilizer MACT. This is the only statistically valid study EPA has conducted for the MACT standards. Generally, sources that operate ethylene oxide sterilizers are smaller stationary sources that sterilize or fumigate medical supplies, pharmaceuticals, and/or spices. EPA randomly selected 70 facilities to inspect out of a universe of 222 facilities. The study found that 50.8 percent of the selected facilities were out of compliance with the MACT standard.

In a statistically valid study conducted in 1999 and 2000, the California Air Resources Board found significant noncompliance with California's Chrome Plating Airborne Toxic Control Measure, the State's equivalent to the Federal Chrome Electroplating MACT. Inspectors in five air districts conducted on-site inspections of 188 chrome platers and found 73 percent of them had some type of violation. The majority of the violations pertained to monitoring, recordkeeping, and reporting: 68 percent of the facilities had a non-emission-related violation; 39 percent had an emission-related violation (a violation that could potentially result in an emission exceedance); and 8 percent had a direct excess emission violation (an emission exceedance witnessed by the inspector).

In a followup to the Chrome Plating compliance rate study, the California Air Resources Board and the individual air districts conducted a number of targeted compliance-related activities for the chrome platers in the study. After conducting these permitting, training, enforcement, and outreach activities, the facilities were inspected again in 2003. The California Air Resources Board found that the noncompliance rate at these facilities had decreased from 78 percent in 1999-2000 to 14 percent in 2003.

EPA's Targeted MACT Initiatives Have Found Noncompliance with MACT Standards

OECA has included air toxics as a National Enforcement Priority since Fiscal Year 2000. For the planning cycle Fiscal Years 2005-2007, OECA implemented an air toxics initiative in which each region selects MACT source categories for targeted compliance investigations and enforcement. EPA's original goal under this initiative was to achieve air toxics emissions reductions of 12,000 pounds each year from these targeted MACTs, for a total reduction of 36,000 pounds by the end of Fiscal Year 2007. However, reported emissions reductions for Fiscal Years 2005 and 2006 under the initiative have greatly exceeded this goal. In Fiscal Year 2005, total reported air toxics emission reductions from regionally targeted cases were 332,000 pounds; for Fiscal Year 2006, they were 356,000 pounds. Most of the violations and resulting emissions reductions were from facilities subject to the Secondary Aluminum MACT, the Hazardous Organic NESHAP, and the Pharmaceutical MACT.

Based on its enforcement activity in Fiscal Years 2004-2005 related to the national air toxics strategy, EPA found significant noncompliance with the LDAR requirements of the MACT standards. Twenty-two MACTs, including the Petroleum Refining MACT and the Hazardous Organic NESHAP, have LDAR requirements. In response to this noncompliance, OECA is conducting a national targeted initiative in Fiscal Year 2006-2007 to focus on MACT equipment leak requirements.

Impact of Self-Monitoring and Reporting Requirements on Compliance and Emissions Reductions

Representatives from five of the eight sampled facilities we interviewed told us that self-monitoring requirements were important to achieving compliance with MACT requirements and gaining emissions reductions. In general, the facility representatives we spoke with told us that internal compliance monitoring, rather than State-conducted on-site inspections, is what drives compliance and emissions reductions. They told us that the self-monitoring required by the MACT standard can help a facility identify a problem before it becomes a violation, and can help ensure that the facility fixes problems more quickly.

The only MACT violations at the nine sample facilities we reviewed were discovered through internal facility monitoring and self-reported by the facilities to State agencies. All three of the primary aluminum facilities have reported violations to the State, two for emissions exceedances and one for failure to record startup and shutdown events. One of the petroleum refineries also self-reported violations pertaining to startup and shutdown maintenance.

Industry representatives told us that self-reporting requirements enable regulatory agencies to become aware of MACT violations that they otherwise may not detect. For example, one refinery representative told us that finding violations would require review of the facility's extensive records, noting that there are about 250,000 components in the LDAR database alone. He said the State does not have the time or expertise to inspect at that degree of specificity. Compliance and enforcement staff from Kansas told us that self-reporting is very important because the State does not have the number of staff nor expertise to find every violation at petroleum refineries. They said the refineries have more knowledge and expertise about their operations than Kansas' inspectors, and this makes it difficult for them to determine if the facility is in compliance. According to one Kansas staff member, the State has to have a lot of trust in the facility. If a facility reports that it is in compliance, the State has to accept that unless their inspectors find otherwise.

State and Industry Representatives Generally Find Compliance Assistance Useful

EPA developed several compliance assistance tools for each of the three MACTs we selected for in-depth analysis. These tools[24] include such documents as plain language guides, applicability flowcharts, and Questions and Answers documents. Six of the seven States and six of the eight facilities we spoke with had used one or more of EPA's compliance assistance tools in implementing the three MACTs in our sample. Representatives from the six States that used the tools, and from five of the six facilities that used the tools, said that they were useful for implementing the MACT. The petroleum refinery representatives we spoke with said they found EPA's Questions and Answers document particularly helpful.

The results of EPA-conducted online surveys on the usefulness of its compliance assistance tools generally showed good results. In 2004 and 2005, EPA surveyed industry and regulators on the usefulness and effectiveness of EPA's compliance assistance tools for four MACT standards: the Aerospace MACT, Plywood MACT, Reciprocating Internal Combustion Engines MACT, and Industrial Boiler MACT. In general, the surveys found that the tools were obtained and used by a large portion of the respondents. Most of the tools were rated as "good" or "very good" in terms of usefulness by a majority of respondents.

State agency staff and industry managers told us that compliance assistance tools could be improved in some areas. For example, EPA did not issue some of the tools until after the compliance date of the MACT. Representatives from three States told us that some of EPA's inspection checklists are of limited value because they cover too much information or are too complicated to use. In addition, an official from one of the refineries told us that many of the tools are labeled "Draft" or included a disclaimer. Thus the guidance may not be very helpful when it comes to inspections or enforcement. For example, the Petroleum Refining MACT Standard Guidance contains a disclaimer that the document is only guidance and does not create any enforceable rights.

[24] A complete list of the tools developed by EPA for these three MACTs is located in Appendix G.

State Representatives Indicated that Compliance Assistance Is More Important for Smaller Facilities

In general, State agency staff told us compliance assistance is most important and useful for smaller facilities. They explained that smaller sources may not be accustomed to being regulated, and that compliance assistance can be critical for effective implementation of the standards at these facilities. In contrast, larger facilities often have environmental staff to implement the regulations and are often members of industry associations that provide environmental compliance training.

Appendix H

Compliance Assistance Tools Developed by EPA for Three Sample MACTs

Petroleum Refinery MACT (Subpart CC)

Petroleum MACT Standard Guidance – Revised to Include Rule Amendments (November 2000)

- Petroleum MACT Standard Guidance – Revised to Include Rule Amendments (November 2000). This document includes:
    - An overview of the standard
    - A summary table of control requirements
    - Applicability flowcharts
    - A summary of testing, monitoring, and reporting requirements
    - A summary table of the overlap of the MACT with other regulations
    - Additional resources and contacts
    - A glossary of terms and definitions used in the standard
    - A summary of amendments to the standard
- Summary of Testing, Monitoring, Recordkeeping, and Reporting Requirements of 40 CFR 63 Subpart CC Petroleum Refineries NESHAP (November 2000)
- Benzene NESHAP FAQ Handbook for Subparts BB and FF (September 1997)
- Questions and Answers for the Refinery MACT I Rule (November 1998)
- List of Petroleum Refineries Affected by the Petroleum Refineries Standards (September 1997)
- Petroleum Refinery MACT - Compliance Assistance/Inspection Checklist (November 2000)
- Petroleum Refinery MACT - Determining Applicability (November 2000)

Primary Aluminum MACT (Subpart LL)

- Plain Language Guide to the Primary Aluminum NESHAP (October 1999). This document includes:
    - An overview of the standard
    - An applicability flowchart
    - A compliance timeline
    - Summary tables of monitoring, recordkeeping, and reporting requirements
    - A summary of test methods and calculations
    - A schedule of notification and reporting due dates
    - Example reports and notifications
    - Contacts for additional help and information
    - An index for the standard, cross-referenced to the Federal Register notice
    - A description of the primary aluminum process and emission points
    - A site-specific test plan

- Inspection Checklist – Primary Aluminum NESHAP (September 2001)
- 1996 Primary Aluminum Source List

Pulp and Paper MACT (Subpart S)

- Pulping and Bleaching System NESHAP for the Pulp and Paper Industry: A Plain English Description (September 2001). This document includes:
    - An overview of the standard
    - A list of Federal Register notices pertaining to the MACT
    - A description of the pulping and bleaching processes
    - Summary tables of monitoring, reporting, and recordkeeping requirements
    - A comparison of MACT and New Source Performance Standards requirements for pulp and paper sources
    - A summary of other air regulations affecting the pulp and paper industry
- Summary Flow Diagrams of the Pulp and Paper MACT Standard (December 1997)
- List of Pulp and Paper Mills Subject to Combined Air and Water Rules (EPA; September 1997)
- Questions and Answers (Q&A's) for Pulp and Paper NESHAP (September 1999)
- Questions and Answers (Q&A's) for the Pulp and Paper NESHAP - Second Volume (March 2000)
- Memo from OAQPS - Clean Condensate Alternative for the Pulp and Paper NESHAP (April 2004)
- Letter from Region 4 - Pulp and Paper MACT Condensate Averaging Times (November 1999)
- Letter from Region 4 - Clarification of the Clean Condensate Alternative (March 2003)
- EPA Office of Compliance Sector Notebook Project: Profile of the Pulp and Paper Industry – 2nd Edition (November 2002)

Agency Response to the Draft Report

OCT 23 2007

MEMORANDUM

SUBJECT: Comments of OIG Evaluation Report: "Improvements in Air Toxics Emissions Data Needed to Conduct Residual Risk Assessments" (OIG-Assignment No. 2005-00111*7)*

FROM: Robert J. Meyers
Principal Deputy Assistant Administrator
for Air and Radiation (6101A)

TO: Wade T. Najjum
Assistant Inspector General for Program Evaluation (2460T)

We appreciate the opportunity to review and comment on the final Office of Inspector General (OIG) report entitled ***"Improvements in Air Toxics Emissions Data Needed to Conduct Residual Risk Assessments"*** (OIG-Assignment No. 2005-00111*7)*. The Office of Air and Radiation (OAR) disagrees with several conclusions reached by OIG as well as with OIG's recommendations contained in the final report. Below, we explain our disagreements along with the activities we have underway to implement the recommendations.

(1) **3-1) We recommend that the Environmental Protection Agency (EPA) develop data quality objectives for using NEI data in conducting residual risk assessments.**

Response: It is OAR's view that quantifiable Data Quality Objectives (DQOs) or acceptance criteria for use of data within the National Emissions Inventory are not practicable or appropriate within the current assembly and use of the National Emissions lnventory (NEI). To fulfill Agency mission goals and objectives using data of known quality, EPA programs develop and implement supporting quality systems. The Office of Air Quality Planning and Standards (OAQPS) uses an applied Quality System, implemented through a formal Quality Management Plan (QMP), to manage the quality of its environmental data collection, generation, and use. To expedite these concepts, OAQPS' QMP requires that projects meeting certain criteria are required to create Quality Assurance Project Plans (QAPP).

For the NEI, EPA uses a Quality System that is based on an acceptance process to determine if the inventory is suitable for the purpose(s) for which it is to be used. This process includes numerous quality reviews by both EPA and our State/local partners. These reviews are both automated (e.g., State IT system checks) and professionally evaluated by experts (e.g., EPA and State staff). The review process generally incorporates multiple elements such as 1) data/information flow monitoring and checks; 2) clear decision points in the data flow; 3) decisions by professional experts in assessing data elements through mass balance calculations, statistical determinations, and other tools; and 4) data acceptance determinations regarding the usability of the data/information for the intended purpose.

These reviews are documented in the plans for inventory development which are updated with each Inventory Cycle (e.g., 1999, 2002, and 2005). For the NEI, project specific plans, similar to a QAPP, have been prepared at the beginning of each 3-year project cycle. Project specific documentation has served as an updated plan by specifying differences from the original plan for each finalized version of a project. The 2005 NET data plan development is located at http://www.epa.gov/ttn/chief/net/2005dataplan.html.

Also, on the EPA CHIEF website (http://www.epa.gov/ttn/chief/net/2002inventory.html) are the other elements of the DQOs and QAPPs such as the Input formats, the Consolidated Emissions Reporting Rule, and Documentation of the 2002 NEI:

In the future, as resources permit, EPA can work with our partners, EPA researchers, and the broader scientific community to identify and incorporate new, and possibly quantifiable, quality measures and acceptance criteria. At this time, quantifiable acceptance criteria for NEI data national data elements are not meaningful or useful. EPA continues to improve the NEI and is currently developing a new data base to improve the timeliness and quality of data and reports from the NEI. As we work with our partners on improving the quality and consistency of data provided, we will continue to consider new Data Quality Objectives appropriate for the use of NEI data and information.

(2) **3-2) We also recommend that EPA establish requirements for State reporting of air toxics emissions data and compliance monitoring information.**

Response: While we agree that establishing requirements for reporting air toxics emissions data to the EPA could improve the quality of such data, we do not believe such requirements are appropriate at this time. We arc currently revising the requirements for State reporting of criteria pollutant emissions to EPA in the Air Emissions Reporting Requirements rule. These changes were proposed last year and we are currently considering public comments, including a comment on this issue. As this is a policy issue under consideration, it is premature to convey our program's position on this issue.

We note that our current, evolving HAP emission inventory efforts should continue to improve progress in improving HAP emissions inventory data quality. Working with our State and local partners and industry, we believe these efforts can achieve the desired data quality results. The EPA has developed national level inventories of HAP emissions on a 3 year cycle since 1990. The success of EPA's efforts rests in large measure on the cooperation of states in submitting HAP data to EPA to support the development of national HAP emission inventories. Each emission inventory cycle has benefited from increased state agency participation in submitting HAP data. We believe it will he possible to continue developing and improving national level HAP inventories using the cooperative approach employed to date but intend to closely monitor the participation of State agencies and industry in this effort. We also expect EPA's new Emissions Inventory System (EIS), when completed, to improve HAP inventory quality. The EIS, by further automating data handling and analysis, and providing inventory transparency, will facilitate identification and resolution of both HAP and criteria pollutant inventory data issues. We understand and appreciate the objectives inherit in your recommendation regarding the need for a HAP data reporting rule. We may revisit this recommendation in the future should our voluntary efforts to improve this data not meet our program needs.

In closing, I would like to thank the Office of the Inspector General for working with us in developing the final report and offering its recommendations. If you have additional questions after reviewing this response and the documents cited therein, please do not hesitate to request a briefing. Thank you for the opportunity to formally respond to the recommendations contained in the Office of Inspector General (OIG) report entitled ***"Improvements in Air Toxics Emissions Data Needed to conduct Residual Risk Assessments.***

Attachment

cc: Pete Cosier, OAR Audit Follow-up Coordinator
Michael Boucher, OAQPS Audit Follow-up Coordinator
Rick Beusse, Director for Program Evaluation, Air Issues, OlG

Appendix J

Distribution

Office of the Administrator
Principal Deputy Assistant Administrator for Air and Radiation
Agency Followup Official (the CFO)
Agency Followup Coordinator
Office of General Counsel
Associate Administrator for Congressional and Intergovernmental Relations
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