Economic Impact Analysis of the Halogenated Solvent Cleaners Residual Risk Standard

EPA-452/R-07-005
April 2007

Economic Impact Analysis of the Halogenated Solvent Cleaners Residual Risk Standard

U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Health and Environmental Impacts Division
Air Benefits and Costs Group
Research Triangle Park, NC

Executive Summary

The EPA has prepared a revised standard to reduce the amount of risk associated with exposure to hazardous air pollutants (HAPs) such as methylene chlorine (MC), perchloroethylene (PCE), and trichloroethylene (TCE) from existing and new halogenated solvent cleaning machines. This standard will revise current limits on these emissions from such machines. EPA promulgated a maximum achievable control technology (MACT) standard in 1994 to set emission limits on these three pollutants emitted from existing and new halogenated solvent cleaning machines (or degreasers) to reduce such emissions. The final standard will revise these limits based on a finding that sufficient residual risk exists to warrant a tighter standard.

This report provides the economic impacts associated with this standard. The impacts in this report are estimated based on comparisons of annualized compliance costs to the revenues for affected firms. We find that the impacts of these options are generally minimal to small businesses, and that large businesses should experience cost savings for the most part. No small business, or any business affected by this final rule, is expected to have annualized compliance costs of more than 0.7 percent of their revenues. We find that small firms represent approximately one-third of the businesses affected under the final rule, and that 40 percent of the affected small firms will experience either no costs or cost savings. There is no significant economic impact on a substantial number of small entities (or SISNOSE) associated with this final standard.

Introduction

The EPA has issued revised HAP standards in this rulemaking to limit emissions of methylene chloride (MC), perchloroethylene (PCE), and trichloroethylene (TCE) from existing and new halogenated solvent cleaning machines. In 1994, EPA promulgated technology-based emission standards to control emissions of methylene chloride (MC), perchloroethylene (PCE), trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), carbon tetrachloride (CT), and chloroform (C) from halogenated solvent cleaning machines (59 FR 61801, December 2, 1994). Pursuant to the Clean Air Act (CAA) section 112(f), EPA has evaluated the remaining risk to public health and the environment following implementation of the technology-based rule and is setting more stringent standards in order to protect public health with an ample margin of safety. In addition, EPA has reviewed the standards as required by section 112 (d)(6) of the CAA and has determined that, taking into account developments in practices, processes, and control technologies, no further action is necessary at this time to revise the national emission standards under section 112 (d) (6). The standards will provide further reductions of MC, PCE, and TCE beyond the 1994 national emission standards for hazardous air pollutants (NESHAP), based on application of facility-wide MC, PCE and TCE emission standards.

Profile of Affected Industries

Halogenated solvent cleaners are found primarily in manufacturing industries found in NAICS codes 332999, 337124, 335999, 336999, 332116, and 336 and 339. A description of each of these NAICS codes is contained below.

NAICS 332999: All Other Miscellaneous Fabricated Metal Product Manufacturing. This U.S. industry comprises establishments primarily engaged in manufacturing fabricated metal products (except forgings and stampings, cutlery and handtools, architectural and structural metals, boilers, tanks, shipping containers, hardware, spring and wire products, machine shop products, turned products, screws, nuts and bolts, metal valves, ball and roller bearings, ammunition, small arms and other ordnances, fabricated pipes and pipe fittings, industrial patterns, and enameled iron and metal sanitary ware).

NAICS 337124: Metal Household Furniture Manufacturing. This U.S. industry comprises establishments primarily engaged in manufacturing metal household-type furniture and freestanding cabinets. The furniture may be made on a stock or custom basis and may be assembled or unassembled (i.e., knockdown).

NAICS 335999: All Other Miscellaneous Electrical Equipment and Component Manufacturing. This U.S. industry comprises establishments primarily engaged in manufacturing industrial and commercial electric apparatus and other equipment (except lighting equipment, household appliances, transformers, motors, generators, switchgear, relays, industrial controls, batteries, communication and energy wire and cable, wiring devices, and carbon and graphite products). This industry includes power converters (i.e., AC to DC and DC to AC), power supplies, surge suppressors, and similar equipment for industrial-type and consumer-type equipment.

NAICS 336999: All Other Transportation Equipment Manufacturing. This U.S. industry comprises establishments primarily engaged in manufacturing transportation equipment (except motor vehicles, motor vehicle parts, boats, ships, railroad rolling stock, aerospace products, motorcycles, bicycles, armored vehicles and tanks).

NAICS 332116: Metal Stamping. This U.S. industry comprises establishments primarily engaged in manufacturing unfinished metal stampings and spinning unfinished metal products (except crowns, cans, closures, automotive, and coins). Establishments making metal stampings and metal spun products and further manufacturing (e.g., machining, assembling) a specific product are classified in the industry of the finished product. Metal stamping and metal spun products establishments may perform surface finishing operations, such as cleaning and deburring, on the products they manufacture.

NAICS 336: Transportation Equipment Manufacturing. Industries in the Transportation Equipment Manufacturing subsector produce equipment for transporting people and goods. Transportation equipment is a type of machinery. An entire subsector is devoted to this activity because of the significance of its economic size in all three North American countries.

NAICS 339: Miscellaneous Manufacturing. Industries in the Miscellaneous Manufacturing subsector make a wide range of products that cannot readily be classified in specific NAICS subsectors in manufacturing. Processes used by these establishments vary significantly, both among and within industries. For example, a variety of manufacturing processes are used in manufacturing sporting and athletic goods that include products, such as tennis racquets and golf balls. The processes for these products differ from each other, and the processes differ significantly from the fabrication processes used in making dolls or toys, the melting and shaping of precious metals to make jewelry, and the bending, forming, and assembly used in making medical products.

Table 1 provides percentages of the number of firms and establishments (or facilities) that are in the NAICS codes listed above.

Table 1. Percentage of Firms and Establishments with Less than 500 Employees by NAICS Code

NAICS Code	Firms (%)	Establishments (%)
332999	97.38%	96.39%
337124	95.87%	90.45%
335999	92.14%	90.40%
336999	94.52%	90.98%

332116	95.11%	92.51%
336	94.39%	80.95%
339	98.59%	96.07%

(Information obtained from Statistics of U.S. Businesses, 2001, U.S. Census Bureau.)

We see from this table that these industries are largely dominated by small businesses and establishments (or facilities). We also note that certain non-manufacuring industries such as railroad (NAICS 482), bus (NAICS 485), aircraft (NAICS 481), and truck (NAICS 484) maintenance facilities; automotive and electric tool repair shops (NAICS 811); and automobile dealers (NAICS 411) also use halogenated solvent cleaning machines.

Economic Growth For These Industries:

A projection of the average annual rate of change in output from 2002 to 2012 for 4-digit NAICS codes for these industries shows expected output increases ranging from 1.2 to 5.2 % (Monthly Labor Review, Bureau of Labor Statistics, February 2004). Thus, moderate economic growth is expected in these industries over the next several years.

I. Background for Final Rule

A. Statutory authority for regulating hazardous air pollutants (HAP)

Section 112 of the Clean Air Act (CAA) establishes a two-stage regulatory process to address emissions of hazardous air pollutants (HAP) from stationary sources. In the first stage, after EPA has identified categories of sources emitting one or more of the HAP listed in the CAA section 112(d) calls for us to promulgate national technology-based emission standards for sources within those categories that emit or have the potential to emit any single HAP at a rate of 10 tons or more per year or any combination of HAP at a rate of 25 tons or more per year (known as "major sources"), as well as for certain "area sources" emitting less than those amounts. These technology-based standards must reflect the maximum reductions of HAP achievable (after considering cost, energy requirements, and non-air health and environmental impacts) and are commonly referred to as maximum achievable control technology (MACT) standards.

For area sources, CAA section 112(d)(5) provides that the standards may reflect generally available control technology or management practices in lieu of MACT, and are commonly referred to as generally available control technology (GACT) standards.

EPA is then required to review these technology-based standards and to revise them "as necessary, taking into account developments in practices, processes and control technologies," no less frequently than every eight years.

CAA section 112(f)(2) requires us to determine for each section 112(d) source category whether the MACT standards protect public health with an ample margin of safety. If the MACT standards for HAP "classified as a known, probable, or possible human carcinogen do not reduce lifetime excess cancer risks to the individual most exposed to emissions from a source in the category or subcategory to less than 1-in-1 million," EPA must promulgate residual risk standards for the source category (or subcategory) as necessary to provide an ample margin of safety. The EPA must also adopt more stringent standards to prevent an adverse environmental effect (defined in CAA section 112(a)(7) as "any significant and widespread adverse effect * * * to wildlife, aquatic life, or natural resources * * *."), but must consider cost, energy, safety, and other relevant factors in doing so.

B. Halogenated solvent cleaning – background on processes

Halogenated solvent cleaning machines use halogenated solvents (methylene chloride, perchloroethylene, trichloroethylene, 1,1,1,-trichloroethane, carbon tetrachloride, and chloroform), halogenated solvent blends, or their vapors to remove soils such as grease, oils, waxes, carbon deposits, fluxes, and tars from metal, plastic, fiberglass, printed circuit boards, and other surfaces. Halogenated solvent cleaning is typically performed prior to processes such as painting, plating, inspection, repair, assembly, heat treatment, and machining. Types of solvent cleaning machines include, but are not limited to, batch vapor, in-line vapor, in-line cold, and batch cold solvent cleaning machines. Buckets, pails, and beakers with capacities of 7.6 liters (2 gallons) or less are not considered solvent cleaning machines.

Halogenated solvent cleaning does not constitute a distinct industrial category, but is an integral part of many major industries. Based on data in our latest National Emissions Inventory (NEI), the five 3-digit NAICS Code that use the largest quantities of halogenated solvents for cleaning are NAICS 337 (furniture and related products manufacturing), NAICS 332 (fabricated metal manufacturing), NAICS 335 (electrical equipment, appliance, and component manufacturing), NAICS 336 (transportation equipment manufacturing), and NAICS 339 (miscellaneous manufacturing). Additional industries that use halogenated solvents for cleaning include NAICS 331 (primary metals), NAICS 333 (machinery), and NAICS 334 (computer and electronic equipment man.). Non-manufacturing industries such as railroad (NAICS 482), bus (NAICS 485), aircraft (NAICS 481), and truck (NAICS 484) maintenance facilities; automotive and electric tool repair shops (NAICS 811); and automobile dealers (NAICS 411) also use halogenated solvent cleaning machines.

We estimated that there were approximately 16,400 batch vapor, 8,100 in-line, and perhaps as many as 100,000 batch cold cleaning machines in the U.S. prior to promulgation of the MACT standards. More recent information shows that the current number of cleaning machines is much lower than these pre-MACT estimates. We currently estimate the number of sources in this source category to be about 3,800 cleaning machines located at 1,900 facilities in the U.S. This estimate is based on information we collected in 1998, a year after compliance with the MACT occurred and should reflect the decreases in HAP emissions and demand that were expected due to implementation of MACT control technologies and work practice standards. More recent evidence on solvent usage suggests that the number of sources in the source category may have declined further in the post-MACT implementation years. An analysis of market data for halogenated solvents showed that the demand for degreasing solvents declined substantially in the five years following the implementation of the MACT standard. From 1998 to 2003, the demand for tetrachloroethylene, trichloroethylene, methylene chloride, and 1,1,1-trichloroethane for degreasing decreased by 39 percent, 35 percent, 23 percent, and 15 percent, respectively.

There are two basic types of solvent cleaning machines: batch cleaners and in-line cleaners. Both cleaner types can be designed to use either solvent at room temperature (cold cleaners) or solvent vapor (vapor cleaners). The vast majority of halogenated solvent use is in vapor cleaning, both batch and in-line. The most common type of batch cleaner that uses halogenated solvent is the open-top vapor cleaner (OTVC).

Batch cleaning machines, which are the most common type, are defined as a solvent cleaning machine in which individual parts or sets of parts move through the entire cleaning cycle before new parts are introduced. Batch cleaning machines include cold and vapor machines. In batch cold cleaning machines, the material being cleaned (i.e., the workload) is immersed, flushed, or sprayed with liquid solvent at room temperature. Most batch cold cleaners are small maintenance cleaners (e.g., carburetor cleaners) or parts washers that often use non-HAP solvent mixtures for cleaning. Batch cold cleaning equipment sometimes includes agitation to improve cleaning efficiency.

In batch vapor cleaning machines, parts are lowered into an area of dense vapor solvent for cleaning. The most common type of batch vapor cleaner is the open-top vapor cleaner. Heating elements at the bottom of the cleaner heat the liquid solvent to above its boiling point. Solvent vapor rises in the machine to the height of chilled condensing coils on the inside walls of the cleaner. The condensing coils cool the vapor causing it to condense and return to the bottom of the cleaner. Cleaning occurs in the vapor zone above the liquid solvent and below the condensing coils, as the hot vapor solvent condenses on the cooler workload surface. The workload or a parts basket is lowered into the heated vapor zone with a mechanical hoist.

Batch vapor cleaning machines vary greatly in size and design to suit applications in many industries. Batch vapor cleaner sizes are defined by the area of the solvent/air interface.

Emissions from batch cold cleaning machines result from evaporation of solvent from the solvent/air interface, "carry out" of excess solvent on cleaned parts, and other evaporative losses such as those that occur during filling and draining. Evaporative emissions from the solvent/air interface are continual whether or not the machine is in use. These evaporative losses can be reduced by limiting air movement over the solvent/air interface (e.g., with a machine cover or by reducing external drafts) or by limiting the area of solvent air interface (e.g., with a floating water layer). Emissions related to solvent carry out occur only when the cleaning machine is in use.

The closed-loop cleaning system is a type of batch cleaner with a closed system capable of reusing solvent. Parts are placed inside a vacuum chamber. Vapor or liquid solvent is pumped in the chamber to clean the parts. Once cleaned, the parts are dried under vacuum and removed; the solvent is removed and recycled. Because these systems are constructed to maintain a vacuum, they have the potential to reduce emissions up to 95 percent.

Cold and vapor in-line (i.e., conveyorized) cleaning machines, which include continuous web cleaners, employ automated parts loading and are used in applications where there is a constant stream of parts to be cleaned. In-line cleaners usually are used in large-scale industrial operations (e.g., auto manufacturing) and are custom-designed for specific workload and production characteristics (e.g., workload size, shape, and production rate). In-line cleaners clean parts using the same general techniques used in batch cleaners: cold in-line cleaners spray or immerse parts in solvent, and vapor in-line cleaners clean parts in a zone of dense vapor solvent.

Emissions from cold and vapor in-line cleaning machines result from the same mechanisms (e.g., evaporation, diffusion, carryout) that cause emissions from cold and vapor batch cleaning machines. However, the emission points for in-line cleaners are different from those for batch cleaners because of differences in machine configurations. In-line cleaning machines are semi-enclosed above the solvent/air interface to control solvent losses. In most cases, the only openings are the parts entry and exit ports. These openings are the only emissions points for downtime and idling modes. Carryout emissions add to emissions during the working mode. Idling and working mode emissions from the in-line cleaner are significantly less than emissions from an equally-sized batch vapor cleaner. However, in-line cleaners tend to be much larger than batch vapor cleaners. Some in-line cleaners have exhaust systems that pump air from inside the cleaning machine to an outside vent. Exhaust systems for in-line cleaners reduce indoor emissions from the cleaning machine but increase solvent consumption.

Continuous web cleaners are a subset of in-line cleaners and are used to clean products such as films, sheet metal, and wire in rolls or coils. The workload is uncoiled and conveyorized throughout the cleaning machine at speeds in excess of 11 feet per minute and recoiled or cut as it exits the machine. Emission points from continuous cleaners are similar to emission points from other inline cleaners. Continuous cleaners are semi-enclosed, with emission points where the workload enters and exits the machine. Squeegee rollers reduce carry out emissions by removing excess solvent from the exiting workload. Some continuous machines have exhaust systems similar to those used with some other in-line cleaners.

C. Health effects from exposure to halogenated solvents

Methylene chloride, perchloroethylene, trichloroethylene, and 1,1,1,-trichlorothane are the primary halogenated solvents used for solvent cleaning. Although production of 1,1,1,-trichlorothane has ceased in the United States, a declining quantity of stockpiled TCA continues to be used. Carbon tetrachloride and chloroform are no longer used as degreasing solvents. Therefore, their health effects are not of a concern in this final standard.

Methylene chloride is predominantly used as a solvent. The acute effects of methylene chloride inhalation in humans consist mainly of nervous system effects including decreased visual, auditory, and motor functions, but these effects are reversible once exposure ceases. The effects of chronic exposure to methylene chloride suggest that the central nervous system is a potential target in humans and animals. Human data are inconclusive regarding methylene chloride and cancer. Animal studies have shown increases in liver and lung cancer and benign mammary gland tumors following the inhalation of methylene chloride. EPA has classified methylene chloride as a Group B2, probable human carcinogen. EPA is currently reassessing its potential toxicity/carcinogenicity. All activities related to this reassessment are expected to be complete by the middle of 2009.

Perchloroethylene (or Tetrachloroethylene) is widely used for dry-cleaning fabrics and metal degreasing operations. The main health effects of PCE are neurological, liver, and kidney damage following acute (short-term) and chronic (long-term) inhalation exposure. Animal studies have reported an increased incidence of liver cancer in mice via inhalation, kidney cancer, and mononuclear cell leukemia in rats. PCE was considered to be a "probable carcinogen" (Group B) when assessed under the previous 1986 Guidelines by the EPA Science Advisory Board. EPA is currently reassessing its potential carcinogenicity. All activities related to this reassessment are expected to be complete by late 2008.

The acute inhalation exposure effects from 1,1,1-trichloroethane include hypotension, mild hepatic effects, and central nervous system depression. Cardiac arrhythmia and respiratory arrest may result from the depression of the central nervous system. Symptoms of acute inhalation exposure include dizziness, nausea, vomiting, diarrhea, loss of consciousness, and decreased blood pressure in humans. After chronic inhalation exposure to 1,1,1-trichloroethane, some liver damage was observed in mice and ventricular arrhythmias were observed in humans. EPA has classified 1,1,1-trichloroethane as a Group D, not classifiable as to human carcinogenicity. EPA is currently reassessing its potential toxicity (related to chronic and less than-lifetime exposures). All activities related to this reassessment are expected to be complete by the fall of 2007.

Most of the trichloroethylene used in the United States is released into the atmosphere from industrial degreasing operations. Acute and chronic inhalation exposure to trichloroethylene can affect the human central nervous system, with symptoms such as dizziness, headaches, confusion, euphoria, facial numbness, and weakness. Liver, kidney, immunological, endocrine, and developmental effects have also been reported in humans. A recent analysis of available epidemiological studies reports trichloroethylene exposure to be associated with several types of cancers in humans, especially kidney, liver, cervix, and lymphatic system. Animal studies have reported increases in lung, liver, kidney, and testicular tumors and lymphoma. EPA has classified trichloroethylene as a Group B2/C, an intermediate between a probable and possible human carcinogen. EPA should complete its reassessment of the cancer classification of trichloroethylene by late 2010.

Toxicity or status information for the four HAPs may be obtained from the following websites: EPA's Toxicity database at http://www.epa.gov/ttn/atw/toxsource/table1.pdf shows the benchmarks for the four HAPs used in the risk assessment. Specific information underlying the values used may be found at the following locations: California EPA's website at http://www.oehha.ca.gov/air/hot_spots/index.html has the background information on PCE and TCE used to develop the cancer potency values.

The Agency for Toxic Substances and Disease Registry's website at http://www.atsdr.cdc.gov/toxpro2.html has the background information used to develop the non-cancer values for MC and PCE.

EPA's IRIS website at http://www.epa.gov/iris/index.html provides the information supporting the cancer potency value for MC.

Status reports for IRIS chemical reassessments, (i.e., TCA) are available at http://cfpub.epa.gov/iristrac/index.cfm.

II. Summary of the Final Rule Requirements

A. Requirements for major and area sources

Using data from comments on the proposal and the Notice of Data Availability (NODA) published in January 2007, we re-evaluated the costs and technical feasibility of complying with the proposed emission levels. The re-analysis resulted in a final rule that changed from what we proposed, specifically for four industry sectors: narrow tubing manufacturing facilities, facilities that manufacture specialized products requiring continuous web cleaning, aerospace manufacturing and maintenance facilities, and military depot maintenance facilities.

1. What are the Requirements for Halogenated Solvent Cleaning Machines?

As proposed for facilities that emit multiple halogenated solvents, EPA is promulgating a facility-wide emission limit of 60,000 kg/yr (kilograms/year) MC equivalent, as shown in Table 2, applicable to all existing halogenated solvent cleaning machines with the exception of halogenated solvent cleaning machines used by the following industries: facilities that manufacture narrow tubing, facilities that manufacture specialized products requiring continuous web cleaning, aerospace manufacturing and maintenance facilities, and military depot maintenance facilities. The area sources in the halogenated solvent cleaning source category that are subject to GACT are not subject to these additional standards. These sources are the cold batch cleaning machines.

This final rule also requires owners or operators of halogenated solvents cleaning machines that use any one of the halogenated solvents covered by this rule (*i.e.*, MC, PCE or TCE), with the exception of the halogenated solvent cleaning machines used by the above-noted industries, to ensure that facility-wide solvent emissions from all halogenated solvent cleaning activities are less than or equal to the limit for the single halogenated solvent specified in Table 2.

This final rule also requires halogenated solvent cleaning machines that are constructed or reconstructed after August 17, 2006, with the exception of halogenated solvent cleaning machines associated with the above-noted industries, to comply with the 60,000 kg/yr MC equivalent emission limit upon the effective date of this rule or upon startup, whichever occurs later. The revised requirements apply in addition to the 1994 NESHAP.

For area sources subject to the 1994 NESHAP and constructed or reconstructed after August 17, 2006, the final rule revisions add to the previous 1994 NESHAP by requiring implementation of the 60,000 kg/yr MC equivalent emission limit upon the effective date of this rule or upon startup, whichever occurs later.

When a facility's total halogenated solvent emissions from its degreasing operations exceed the emission limit, the facility must implement means to comply with these amended standards. In addition, under this final rule, the 1994 NESHAP requirements for all halogenated solvent cleaning machines remain applicable. Compliance with the emission limit is demonstrated by determining the annual PCE, TCE, and MC emissions for all cleaning machines at the facility, using Equation 1 as necessary, and comparing to the emission limits in Table 2.

There are no additional equipment monitoring or work practice requirements associated with the facility-wide annual emissions limit. Annual emissions of PCE, TCE, and MC are determined based on records of the amounts and dates of the solvents added to cleaning machines during the year, the amounts and dates of solvents removed from cleaning machines during the year, and the amounts and dates of the solvents removed from cleaning machines in solid waste. Records of the calculation sheets showing how the annual emissions were determined must be maintained. A facility will determine compliance with the standards by comparing their annual MC-equivalent emissions to the limits specified in Table 2 of this final rule.

Table 2. – Summary of the Facility-wide Annual Emission Limits

Solvents Emitted	Final General Halogenated Solvent Cleaning Facility-wide Annual Emission Limits in kg/yr	Final Military Maintenance Facility-wide Annual Emission Limits in kg/yr
PCE only	4,800	8,000
TCE only	14,100	23,500
MC only	60,000	100,000
Multiple solvents – Calculate the MC-weighted emissions using equation 1	60,000	100,000

<u>Equation 1</u>:
(kg/yr of PCE emissions x A)+(kg/yr of TCE emissions x B) + (kg/yr of MC emissions) = MC weighted Emissions in kg/yr

In this equation, the facility emissions of PCE and TCE are weighted according to their carcinogenic potency relative to that of MC. Thus, “A” in the equation is the ratio of the URE for PCE to the URE for MC, and the “B” in the equation is the ratio of the URE for TCE to the URE for MC. The value of “A” is 12.5 (see section C below). The value for “B” is 4.25.

2. What are the Requirements for Halogenated Solvent Cleaning Machines at Military Depot Maintenance Facilities?

For existing halogenated solvent cleaning machines in use at military depot maintenance facilities where multiple halogenated solvents are emitted, the final rule sets a facility-wide emission limit of 100,000 kg/yr of MC equivalent emissions as indicated in Table 2. This final rule also limits the use of any one of the halogenated solvents covered by this rule (*i.e.*, MC, PCE or TCE), to the limits for the single halogenated solvent specified in Table 2. In addition, the 1994 NESHAP requirements remain applicable.

For halogenated solvent cleaning machines that are constructed or reconstructed after August 17, 2006 and that are to be used at military depot maintenance facilities, the final rule revisions add to the previous 1994 NESHAP by requiring implementation of the 100,000 kg/yr MC equivalent emission limit upon the effective date of this rule or upon startup, whichever occurs later.

We define Military Depot Maintenance Facility in this rule as a Government-owned industrial center that operates solely for the purpose of repairing, modifying, converting and refitting worn and/or damaged military assets for redistribution to active military units. Depot level maintenance includes the repair, fabrication, manufacture, rebuilding, assembly overhaul, modification, refurbishment, rebuilding, test, analysis, repair-process design, in-service engineering, upgrade, painting and disposal of parts, assemblies, subassemblies, software, components, or end items that require industrial shop facilities, tooling, support equipment, and/or personnel of higher technical skills, or processes beyond the military installation's organizational level capability.

3. What are the Requirements for Continuous Web Cleaners and Halogenated Solvent Cleaning Machines at Narrow Tube Manufacturing and Aerospace Industries?

The requirements set forth in this final rule are not applicable to continuous web cleaning machines, halogenated solvent cleaning machines that are located at narrow tubing manufacturing facilities, and the aerospace manufacturing and maintenance industry and facilities. A narrow tube manufacturing facilities primarily engage in the production of small diameter (mechanical and hypodermic size) cold drawn metallic, seamless tubes from materials such as stainless steel, nickel alloys, titanium and its alloys, and alloys of zirconium with a portion of the outside diameters 1/4” or less (a subset of NAICS 331210), and are sources of any of the four chlorinated HAPs. Aerospace manufacturing and maintenance facilities manufacture, rework, or repair aircraft such as airplanes, helicopters, missiles, rockets, and space vehicles, and are subject to the 1994 NESHAP. The 1994 NESHAP requirements remain applicable to all the continuous web and halogenated solvent cleaning machines associated with the above-noted facilities.

For the above-noted facilities, we are adopting no changes to the 1994 NESHAP under CAA Section 112(f) because the current level of control called for by the existing NESHAP both reduces HAP emissions to levels that present an acceptable level of risk, protects public health with an ample margin of safety, and prevents any adverse environmental effects. The finding regarding an "ample margin of safety" is based on a consideration of the additional costs of further control as represented by compliance with the 60,000 kg/yr MC equivalent facility-wide emissions limit and the relatively small reductions in health risks that are achieved by that alternative (see Section III.B., below for a discussion of our rationale for this final rule).

III. Rationale for the Final Rule

A. What is our approach for developing residual risk standards?

Based on comments and data received on both the proposal and the NODA, we re-evaluated the risk, the technical feasibility, the costs of the proposed options, the economic impacts, and the compliance time needed to implement the proposed options. This re-analysis focused especially on the four industry sectors discussed above. Additionally, in response to public comments we updated the risk assessment for the entire source category using the 2002 National Emissions Inventory (NEI) database which was not available for the proposal. The following rationale presents the results of our re-analysis of the data.

1. Revision of the Baseline Risk Estimate

Based on public comment, we used the 2002 NEI inventory to re-analyze the risk from this source category. The resulting re-analysis of risk at the baseline emission level (i.e., the level of emissions allowed by the 1994 MACT) indicated that the maximum individual cancer risk (MIR) associated with this source category is 100-in-a-million with an annual cancer incidence of 0.55. This is as compared to the 200-in-a-million MIR and 0.40 annual cancer incidence level that we presented at proposal, which was based on the 1999 NEI database. We consider both MIR values to be acceptable levels of maximum individual risk considering the number of people exposed at these levels and the absence of other adverse human and environmental health effects. We note that the MIR of 100-in-a-million (calculated using the 2002 NEI data) is the same regardless of the URE for PCE chosen for the risk analysis (i.e., the CalEPA value or the OPPTS value, which results were contrasted at proposal). This is because PCE is not the only driver of the MIR risk level for the highest risk facilities.

Given the uncertainties associated with the development of emission inventories, neither the 1999 nor the 2002 NEI inventory should be considered as correct in an absolute sense or as suggesting temporal trends in degreasing machine populations or emissions. Rather, we consider them to be “snapshots” of the true long-term inventory of emissions for this source category, each carrying its own degree of uncertainty. As such, the derived risk assessment results compared above should be regarded as ranges within which the true risk metrics are likely to fall.

The revised population risk distribution at baseline emission levels shows that about 25 people are exposed to the MIR risk level, about 22,000 people are at estimated risks of ≥ 10-in-a-million risk level, and about 4,000,000 people are at estimated risks of ≥ 1-in-a-million. This is compared to approximately 90 people exposed to risks at the MIR level (200-in-a-million), about 42,000 people at estimated risks of ≥ 10-in-a-million risk level, and about 6,000,000 people at estimated risks of ≥ 1-in-a-million that we presented at proposal. Similar to the MIR and annual cancer incidence metrics, these values may be an indication of the uncertainty presented by the databases because, as earlier explained, both inventories are “snapshots” of the industry rather than an absolute reflection of the “current” state of the industry.

We did not reassess the environmental risks using the 2002 NEI inventory but believe that no "adverse environmental effects," as defined in CAA section 112 (a)(7), would occur given the similarities of the human health risk results between the 1999 NEI data and 2002 NEI data and the fact that we showed in the proposal that no adverse environmental effects would likely occur using the 1999 NEI inventory.

1. Rationale for the 60,000 kg/yr MC Equivalent Emission Limit

EPA is promulgating a facility-wide emission limit of 60,000 kg/yr (MC equivalent emissions) applicable to emissions from all new and existing halogenated solvent cleaning machines that are subject to the 1994 NESHAP, with the exception of halogenated solvent cleaning machines used by the following industry sectors: narrow tubing manufacturing, facilities that manufacture specialized products requiring continuous web cleaning, aerospace manufacturing and maintenance, and military depot maintenance operations (cold batch cleaning machines, which are subject to GACT). Area sources operating halogenated solvent cleaning machines that are subject to GACT also are not required to comply with the facility-wide emission limits.

This final rule reflects our decision that the 60,000 kg/yr MC equivalent emission limit (Option 1) from the August 17, 2006 proposal, provides an ample margin of safety to protect public health under the provisions of CAA section 112(f)(2) and prevents adverse environmental effects.

In response to public comments we re-examined the data and assumptions used to estimate the costs presented in the preamble to our proposed rule. We determined that certain significant data and assumptions that we used to develop our cost estimates at proposal were either no longer relevant, not reflective of more recent inventory data, or not valid. As a result, we re-evaluated risks using the more recent inventory data and modified our cost estimates in response to public comment. The most important change we made is that we re-analyzed the risk metrics and costs using the halogenated solvent cleaning facilities in the finalized 2002 NEI, but removing facilities in four specific industry sectors -- aerospace manufacture and maintenance facilities, narrow tube manufacturing facilities, facilities using continuous web cleaning machines, and military equipment maintenance facilities -- from the database for the purpose of estimating the risks and compliance costs associated with the remaining facilities (Sections III.A.3 and III.B.3 explain our rationale for removing the facilities in these industry sectors from this analysis).

As a result, we modified our cost estimates as follows:

- We used the finalized 2002 NEI database containing facility and emissions data as the source of our baseline emissions estimates. We removed aerospace manufacture and maintenance facilities, narrow tube manufacturing facilities, facilities using continuous web cleaning machines, and military equipment maintenance facilities from the database for the purpose of estimating the compliance costs for the remaining facilities. We changed our assumptions about the percent reductions in emissions can be achieved by vacuum-to-vacuum machines. We assumed that vacuum-to-vacuum machines could achieve 95 percent reduction, rather than 97 percent.

- In the proposal, we assigned no operation and maintenance costs to vacuum-to-vacuum machines; however, our evaluation for this final rule incorporates an O&M cost $18,832 for each affected solvent cleaner.
- We updated the cost per gallon of PCE and TCE based on information provided by commenters representing manufacturers of solvents and the narrow tube manufacturing industry.
- We added a carbon adsorption device (CAD) option, not used in the proposed cost assumptions, that assumes a 30 percent control in emissions. We received comments that this option may work in some industries but that it is 10 times more expensive than the retrofit options we costed for the proposal.

We reduced the number of units to which solvent switching could be applied from 30 percent, used in the proposal, to 15 percent. Moreover, we corrected a flaw in our method for calculating the emission reduction impacts and solvent savings associated with solvent switching.

After calculating revised cost estimates, we re-examined our decision as to what level of control is necessary to provide an ample margin of safety to protect human health and to prevent adverse environmental effect, as required by the second step of the residual risk process under CAA section 112(f)(2). In addition to the revised cost estimates, we considered revised estimates of health risk and other health information along with additional factors consistent with the 1989 Benzene HESHAP (54 FR 38044, (September 14, 1989)), such as technological feasibility, uncertainties and other relevant factors as discussed at proposal. We reanalyzed risk using the halogenated solvent cleaning facilities in the 2002 NEI, but removing aerospace manufacture and maintenance facilities, narrow tube manufacturing facilities, facilities using continuous web cleaning machines, and military equipment maintenance facilities. For this subset of facilities, implementation of the 60,000 kg/yr emission limit is expected to reduce the MIR from 100 in-a-million to 20 in-a-million, will reduce the annual cancer incidence by 0.21 cases/year and will reduce the number of people exposed to risk greater than or equal to 1 in-a-million to about 500,000 people.

Further, we estimated that compliance with the 60,000 kg/yr emission limit will reduce emissions by approximately 900 tons per year with an annualized cost savings of $-1,326,000, resulting in an annualized cost-effectiveness of complying with this limit of about $830/ton (in savings). Given the reduction in annual cancer incidence of between 0.19 cases per year and the total annualized cost savings of $-1,326,000, the cost per cancer case avoided is about $7 million. The Agency also notes that much more than half of the facilities implementing this level of control would recognize a savings in annualized costs that is primarily from solvent savings.

In addition to the 40,000 kg/yr MC equivalent emission limit, we proposed on August 17, 2006, a more stringent MC equivalent emission limit of 25,000 kg/yr. Comments received included support for and against this level of emissions reduction. Our revised risk estimate for the 25,000 kg/yr emission limit shows a reduction in the MIR from 100 in-a-million to 10 in-a-million with a corresponding reduction in annual cancer incidence of 0.24 cases/year. At proposal, we estimated the total annualized cost and cost effectiveness of the 25,000 kg/yr MC equivalent emission limit would be about $4.9 million savings with a cost effectiveness of $700 saving per ton reduced. Our current analysis shows a total annualized cost of about $800,000 with a cost effectiveness of about $600 per ton reduced.

In addition to these revised risk and cost estimates, we duplicated the analysis we presented in the proposal that calculates the incremental annualized cost per cancer case avoided. In this case, we compared the proposed 40,000 kg/yr option and a less-stringent alternative (in this case, a 60,000 kg/yr MC equivalent emission limit) that was considered and presented in the proposal, but not selected as one of our two proposed options. Given the reduction in incidence of 0.21 cancer cases/yr at the 40,000 kg/yr level and the total annualized cost of $235,000, the cost per cancer case avoided is about $1.1 million.[1] For the 60,000 kg/yr level, there is a reduction in incidence of 0.19 cases/yr and a total annualized cost savings of $663,551, resulting in a savings of $3,492,373 per cancer case avoided. The 60,000 kg/yr level reduces 90 percent of the emissions reduced at the 40,000 kg/yr level. The incremental incidence avoided between the 40,000 kg/yr level and the 60,000 kg/yr level is 0.02 cases.

When we applied our revised cost assumptions to the 1999 NEI database list of facilities affected at the 40,000 kg/yr level, we estimate a total annualized cost savings of $1,100,000 and

[1] For comparison purposes, we used the costs associated with complying with the requirements of the National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities Final Rule (71 FR 42727, July 27, 2006), which resulted in an annualized cost of about $7 million to achieve a cancer incidence reduction of 2 cancer cases per year. This yields a cost of $3.5 million per cancer case avoided based on the CalEPA unit risk estimate for PCE.

a cost effectiveness that is a savings of about $600 per ton per year. Comparing the results of the two databases, we see a range of $1,300,000 for annualized costs trending toward savings and a range of about $830 to values that are savings in the cost effectiveness. When the cost assumptions developed as a result of public comments and used in this final rule are applied to the corresponding facilities in the 1999 database, we estimate a savings in the annualized cost of control as well as savings for every ton of solvent controlled by the facility.

After considering revisions to the risk and cost estimates presented at proposal, our recent re-analyses, we believe that the 60,000 kg/yr MC equivalent emission limit for those halogenated solvent cleaning machines not identified as being in use by one of the four sectors discussed above, protects public health with an ample margin of safety and prevents adverse environmental effects.

3. Rationale for the Requirements for Halogenated Solvent Cleaning Machines at Military Depot Maintenance Facilities

For halogenated solvent cleaning machines in use at military depot maintenance facilities, the final rule sets a facility-wide emission limit of 100,000 kg/yr (MC equivalent emissions). In addition, the 1994 NESHAP requirements remain applicable.

For halogenated solvent cleaning machines that are constructed or reconstructed after August 17, 2006, the final rule revisions add to the previous 1994 NESHAP by requiring implementation of the 100,000 kg/yr MC equivalent emission limit upon the effective date of this rule or upon startup, whichever occurs later.

We based this decision on comments received from 1 such facility that we considered representative of these types of military facilities that maintain and restore military weapons systems. They indicated an increase in maintenance and restoration levels due to current worldwide military activities and that they could not technically meet the proposed 40,000 kg/yr emission limit within the proposed 2- year compliance period. In additional comments in response to the NODA, and in subsequent meetings, they indicated that they could meet the 100,000 kg/yr emission limit within a 3 year compliance timeframe. We then projected that implementation of the 100,000 kg/yr MC equivalent emission limit will reduce the MIR from halogenated solvent cleaning machines associated with military depot maintenance facilities from about 6 in-a-million to about 3 in-a-million with an estimated reduction in annual cancer incidence to less than 0.002 cancer cases per year. An analysis of the costs for only this facility and based on information from the 2002 NEI shows that the annual cost effectiveness of complying with this limit results in a cost savings of about $630/ton with annualized cost savings of approximately $55,760. Therefore, we believe that a requirement for these facilities to meet a 100,000 kg/yr MC equivalent emission limit is technically feasible, provides an annual and long-term cost savings, provides an ample margin of safety to protect public health and results in no adverse environmental effects.

4. Rationale for our Decisions Regarding Continuous Web Cleaners and Halogenated Solvent Cleaning Machines at Narrow Tube Manufacturing and Aerospace Industries

The requirements set forth in this final rule are not applicable to continuous web cleaning machines, halogenated solvent cleaning machines that are associated with the narrow tubing manufacturing industry, and aerospace manufacturing and maintenance industry and facilities. The requirements of the 1994 NESHAP and its subsequent amendments (when appropriate) remain applicable to all the continuous web and halogenated solvent cleaning machines associated with the above-noted facilities.

We received comments from these three sectors on the proposal, in response to the NODA, and in subsequent meetings with representatives of these industries. They submitted information that stressed the unique nature of their cleaning operations, the technical infeasibility, the uncertainty of our original cost estimates, the processes involved, including review of their process changes by other federal agencies such as FDA and FAA (see below for additional discussion), and the difficulty they would experience in complying with the proposed emission limits within the proposed timeframe. All of the comments and information submitted by these industry representatives are in the public docket for this rulemaking. Based on new information they provided in response to the NODA, including new cost information, we re-analyzed the costs for each of these three sectors and estimated the annual cost effectiveness of complying with emission limits they provided in comments.

For the aerospace sector, we estimated an MIR of 30 in-a-million and an annual cancer incidence of 0.066 at their baseline emission level. We then projected that implementation of the 100,000 kg/yr MC equivalent limit (the maximum reduction we discussed in the proposal) would reduce the MIR from halogenated solvent cleaning machines associated with this sector to about

20 in-a-million with a reduction to their annual cancer incidence to about 0.03 cancer cases annually. Our revised cost estimate showed a cost effectiveness of $2,000/ton with a total annualized cost of $360,000.

For the narrow tube manufacturers, we estimated an MIR of 70 in-a-million with an annual cancer incidence of 0.08 at their baseline level of emissions. Based on comments from this industry indicating that they could reasonably accomplish a 10 percent reduction in their current emission levels within a 3 year compliance time, we developed risk and cost estimates for that level of reduction. We have estimated that the MIR would decrease to approximately 60 in-a-million with very little change expected in the annual cancer incidence. The annual cost effectiveness for complying with an overall 10 percent reduction in total emissions limit would be a cost of over $3,600/ton with total annualized costs of $700,000.

For the continuous web cleaners, we estimated a baseline MIR risk level of about 30 in-a-million with an annual cancer incidence of 0.03. Comments from this industry suggested an 80 percent overall control efficiency, representing a 14 percent increase in efficiency of their current emission levels (70 percent overall control efficiency) within a 3 year compliance period. To reach the 80 percent overall efficiency, facilities would be required to reduce emissions by 33 percent ((1-70%)-(1-80%)/(1-70%) = 33%). We developed risk and cost estimates for that level of reduction. We have estimated that under this scenario, the MIR would decrease to approximately 20 in-a-million with and the annual cancer incidence to 0.02. The annual cost effectiveness of complying with the 80 percent overall emission control efficiency rate is over $3,400/ton with a total annualized costs of about $600,000.[2]

In summary, we are adopting no changes to the 1994 NESHAP, under CAA Section 112(f) for the halogenated solvent cleaning machines used by the above-noted specific industry sectors (i.e., aerospace, narrow tube manufacturers, and the facilities that use continuous web cleaning machines) because the current level of emissions control called for by the existing NESHAP both reduces risk to acceptable levels and provides an ample margin of safety to protect public health. In addition, additional standards are not necessary to prevent adverse environmental effects. The finding regarding an "ample margin of safety" is based on a

[2] For comparison purposes, we used the costs associated with complying with the requirements of the National Perchloroethylene Air Emission Standards for Dry Cleaning Facilities Final rule (71 FR 42727, July 27, 2006), which resulted in an annualized cost of about $7 million to achieve a cancer incidence reduction of 2 cancer cases per year. This yields a cost of $3.5 million per cancer case avoided based on the CalEPA unit risk estimate for PCE.

consideration of the relatively small reductions in health risks likely to result from the feasible emission reductions we evaluated, the additional costs required to achieve further control, the lack of technical feasibility for these sectors, and the time required to comply with any requirements.

C. What is the Compliance Schedule?

We are promulgating a compliance deadline of 3 years from the effective date of this final rule for all existing halogenated solvent cleaning machines and for all existing halogenated solvent cleaning machines at military depot maintenance facilities. Facilities described in aerospace, narrow tube, and continuous web cleaners sectors as described above are exempted from further requirements.

We are persuaded by the commenters representing the general population that use halogenated solvent cleaning machines that existing sources will need more than 2 years to comply with the final revised standards. Affected facilities would have to plan their control strategy, purchase and install the control device(s), and subsequently, bring the control device(s) online. We, therefore, believe that for the remaining halogenated solvent cleaning facilities, this final compliance deadline of 3 years is more reasonable and realistic than the proposed two year compliance deadline.

IV. Costs for Individual Controls

A. Information on Individual Controls

A suite of controls was developed that achieve emission reductions beyond the level of the MACT and that reduce the level of cancer risk associated with the emissions as shown in Table 3. Two of the controls are retrofit controls that can be added to existing cleaning machines, three controls are solvent switching options that reduce cancer risk, and one control requires the replacement of existing equipment with a new vacuum to vacuum cleaning machine.

Table 3. Emission Controls Beyond the MACT Standard and Controls That Reduce Cancer Risk And Costs for Each

Control Type	Description	% Control	Total Capital Costs	Annualized Capital Costs	O&M Costs	Total Annual Emission Control Costs (a)
Control Equipment Retrofits	1.5 Freeboard Ratio (1.0FBR), Working Mode Cover (WC), Freeboard Refrigeration Device (FRD)	50	$25,645	$2,821	$2,015	$4,836
	1.5 Freeboard Ratio (1.5FBR)	30	$20,380	$2,242	$0	$2,242
	CAD – For 2.5 m^2 machines	30	162,687	17,896	8,948	$26,844
Solvent Switching	PCE to MC	11	$15,677	$1,725	$928	$2,653
	PCE to TCE	30	$0	$0	($2,022)[b]	($2,022)
	TCE to MC	29 (increase)	$15,677	$1,725	$2,950	$4,675
Machine Replacement	Vacuum to Vacuum Cleaning Machine	95	$399,000	$37,663	$18,832	$56,495
	Vacuum to Vacuum Cleaning Machine – Small – Basket	95	$150,000	14,159	7,080	$21,239
	Vacuum to Vacuum Cleaning Machine – Small - Hanging	95	$242,000	22,867	11,434	$34,301
	Vacuum to Vacuum Cleaning Machine	95	$584,000	55,125	27,563	$82,688
	Vacuum to Vacuum Cleaning Machine	95	$788,000	74,457	37,229	$111,686

a – Does not include cost savings due to reduced solvent purchases. The solvent savings were calculated for each specific unit based on the volume of solvent emissions reduced and the cost of the specific solvent in $/gal.
b – Values in ( ) indicate a cost savings. Costs are in 2004 dollars.

The costs for the retrofit controls were based on vendor estimates obtained in 2005 and then revised based on comments received on the proposed rule and NODA. The capital costs were based on equipment for a solvent cleaning machine with a solvent-air interface area of 2.5 m^2, which is the average size of the solvent cleaning machines in the database for which size data are available. The annualized capital costs were based on a 15 year equipment lifetime and a 7% interest rate. A 50% emission reduction is expected to result from the addition of the 1.0FBR, WC, and FRD control combination. A 30% emission reduction is expected to result from the addition of a 1.5FBR. These emission reduction percentages were calculated using percent reduction values and procedures that were developed for the NESHAP.

The development of the costs for the solvent switching options included considerations of changes in the cost of the solvent, changes in solvent consumption rates, changes in energy requirements, costs for equipment modifications, and changes in productivity. Capital costs were annualized assuming a 15-year equipment lifetime (retrofit application) or a 20 year equipment lifetime (new control application) and a 7% interest rate. The solvent switching scenarios, their costs, and impacts are fully discussed in a separate memorandum titled "Evaluation of the Feasibility, Costs, and Impacts of Switching from a Halogenated Solvent with a High Cancer Unit Risk Value to a Halogenated Solvent with a Lower Cancer Unit Risk Value" that is available in the public docket for this rulemaking.

Costs for the vacuum-to-vacuum cleaning machines are based on vendor estimates obtained in 2005 and then revised based on comments on the proposed rule and NODA. The vacuum-to-vacuum cleaning machine capital costs were based on the replacement of a solvent cleaning machine with a solvent-air interface area of 2.5 m^2, which is the average size of the solvent cleaning machines in the database for which size data are available.

Capital costs were annualized based on a 20 year equipment lifetime and a 7% interest rate. The 20-year equipment lifetime was determined based on information from equipment manufacturers. It was determined that a 95% reduction in emissions would result from switching from an existing solvent cleaning machine to a vacuum-to-vacuum cleaning machine. The emission reduction estimate was based on case study results as reported in "Pollution Prevention Technology Profile Closed Loop Vapor Degreasing" by the Northeast Waste Management Officials' Association (NEWMOA) dated December 28, 2001. In the study, two cleaning machines saw a reduction in solvent use of 97% and a third saw a reduction in solvent use of

83%. The third machine had a smaller reduction in solvent use due to the heavy soils cleaned by the machine. Therefore, more solvent was being lost to the solid waste stream.

Finally, we added a carbon adsorption device (CAD) to our set of available control measures based on a number of comments who mentioned that this control measure was available for use in most of the industries affected by this final rule. The level of HAP control associated with this device is 30%.

B. Changes in Control Measure Costs from Proposal to Final

Table 4 summarizes the changes in control measure costs between the analysis done for the proposed rule and the final rule. All changes were made in responses to comments on both the proposed rule and the NODA.

Table 4. Changes To Control Cost Methodology Since Proposal

Change	Effect	Notes
Vacuum cleaning machine percent reduction was changed from 97% to 95%	This decreased the amount of reduction achieved.	This change was made as a result of public comments.
Vacuum cleaning machine O&M costs were increased from $0 to $18,832 (half of annualized capital costs).	This increased the annualized costs.	Estimated O&M costs as half of capital costs. Although our contacts with vacuum manufacturers indicated no increase in electricity and labor costs, the costs received from tube and aerospace indicated that there would be an increase in O&M costs.
Addition of CAD control option at 30% control	Increased costs because this control is 10 times more expensive than our other controls at 30%.	This control was added because information received from tube, aerospace, and web indicated that CAD was a viable control option.
Cost per gallon of PCE and TCE were updated (higher prices for PCE and TCE)	Overall effect was a decrease in costs because solvent savings increased.	Costs used were based on commenter submitted costs.
The number of units to which solvent switching was applied was reduced (reduced from 30% of affected units to 15% of affected units).	Since the solvent switching options are lower in cost than other options this increased the costs.	Change made in response to comments.
The methodology that was used to calculate the emission reduction impacts and solvent savings for solvent switching was corrected.	This reduced the emission reductions and had a mixed effect on the solvent savings.	The new methodology more accurately reflects the true effects of solvent switching.
Facility unit and emissions data were updated from 1999 NEI to 2002 NEI	Decreased emission reductions.	Since emissions have gone down there are less emissions above a given level.
Facilities in the Tube, Web, and Aerospace sectors were removed from the subject population.	This decreased the emission reductions.	This change was made in response to public comments.

V. <u>Number of Affected Solvent Cleaners Under the Final Rule</u>

This section presents the number of solvent cleaners affected, and the costs and emission reductions expected for the final rule. Both capital and annualized costs are estimated. First, we show the number of affected solvent cleaners in Table 5.

Table 5: Number of Units Assigned To Each Control Measure

Type of Control Measure	# of Affected Units	% of Units Controlled
Vacuum	20	36
CAD – For 2.5 m^2 Machine	0	0
PCE to MC	2	4
PCE to TCE	2	4
TCE to MC	5	9
Retro – 1.5 FBR, WC, FRD	13	24
Retro – 1.5 FBR	13	24
Total for Units in NEI Subject to Final Residual Risk Standard	55	100

VI. Cost and Emission Reductions for the Final Rule

The costs and emission reductions for all units at all facilities with emissions above the control option limits were totaled to yield the total national costs and emission reductions.

Table 6 provides the costs for the final rule and other regulatory options broken down by capital and annual components and including estimates of the cost savings from solvent recovery. Total annual emission control costs for those sources required to comply with the final rule are $-1,325,832 (2004 dollars). Capital costs for the final rule are $15.1 million. The capital costs for individual facilities range from $0 to $399,000 with an average cost of about $133,000. Annualized capital costs are $1.45 million. Operating and maintenance costs are $724,000. Solvent savings have a significant impact on total annual costs; they total $3.5 million, and this leads to the total nationwide annualized costs to be a cost savings as shown previously. Solvent savings represent the cost savings that result from reduced solvent purchases. All of the cost estimates listed above and shown in Table 6 are scaled up by a factor of 1.734 to adjust the results for the number of potentially affected sources within the 2002 NEI. The cost estimates for sectors that are not subject to this final rule can be found in the cost analysis memo included in the public docket.

Capturing and controlling HSC emissions is a pollution prevention approach where reduced emissions translate into less PCE, TCE and MC consumption and reduced operating costs because facilities would need to purchase less solvent. Using the 2002 NEI database, the highest maximum individual cancer risk is estimated to be reduced from 100 in-1 million to 20 in-a-million (using both OPPTS and CalEPA potency values). The rule is expected to reduce cancer incidence from 0.55 cases annually to 0.36 cases annually, a reduction in cancer incidence of 0.19 cases annually.

EPA also estimates that to comply with the 100,000kg/yr MC equivalent emission limit, military depot maintenance facilities are expected to incur $540,000 in capital costs with annualized savings of about $56,000. Using the 2002 NEI database, the maximum individual cancer risk is estimated to be reduced from six-in-a-million to three-in-a-million. The emission limit for military depot maintenance facilities is expected to reduce cancer incidence by 0.002 cases annually.

Table 6. Summary Table of Costs and Emission Reductions for the Final Rule

DESCRIPTION	Options in kg/yr MC equivalents for the Population of Cleaners Affected by this Final Rule Except for Military Maintenance Facilities				Anniston Army Depot
	25,000	**40,000**	**60,000***	**100,000**	**100,000 kg/yr***
Total Capital Costs	$41,560,768	$26,107,974	$15,144,335	$8,473,912	$536,431
Annualized Capital Costs	$4,028,968	$2,557,105	$1,448,795	$812,736	$59,007
Total Annual Operation and Maintenance Costs	$2,248,569	$1,530,058	$720,063	$416,744	$42,143
Emission Reduction (true tons/yr)	2,351	1,759	1,594	1,104	89
Solvent Credit	$-5,054,032	-$3,957,103	-$3,498,651	-$2,493,972	-$156,912
Net Annualized Cost of Control ($/yr) (Annualized Capital Costs + Solvent Credit)	$1,223,505	$130,060	$-1,325,832	$-1,264,492	-$55,761
Cost Effectiveness ($/ton) (Net Annualized Cost of Control/Emission Reduction)	$520	$74	-$832	-$1,146	-$625

* Represents the facility-wide emissions limit in the final rule. All costs are in 2004 dollars. Cost estimates reflect application of the scale-up factor (1.734) to put these estimates on a comparative basis with the number of potentially affected solvent cleaners in the 2002 NEI.

VI. Economic Impact and Small Business Analysis

These residual risk standards to control halogenated solvents will potentially affect the economic welfare of owners of the facilities using these hazardous air pollutants. The ownership of these facilities ultimately falls on private individuals who may be owner/operators that directly conduct the business of the firm (i.e., "mom and pop shops" or partnerships) or, more commonly, investors or stockholders that employ others to conduct the business of the firm on their behalf (i.e., privately-held or publicly-traded corporations). The individuals or agents that manage these facilities have the capacity to conduct business transactions and make business decisions that affect the facility. The legal and financial responsibility for compliance with a regulatory action ultimately rests with these agents; however the owners must bear the financial consequences of the decisions. Environmental regulations like this rule potentially affect all businesses, large and small, but small businesses may have special problems in complying with such regulations.

The Regulatory Flexibility Act (RFA) generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions. This analysis identified the businesses that will be affected by this rule and provides an analysis to assist in determining whether this rule is likely to impose a significant economic impact on a substantial number of small businesses. The screening analysis employed here is a "sales test" that computes the annualized compliance costs as a share of sales for each company. The "sales test" is the impact methodology EPA employs in analyzing small entity impacts as opposed to a "profits test", in which annualized compliance costs are calculated as a share of profits). This is because revenues or sales data is commonly available data for entities normally impacted by EPA regulations and profits data normally made available is often not the true profits earned by firms due to accounting and tax considerations. Firms and entities often have ways available in the tax code to reduce their reported profits; thus, using reported profits may lead to an overestimate of the economic impact of a regulation to an affected firm or entity and their consumers. The use of a "sales test" for estimating small business impacts for a rulemaking such as this one is consistent with guidance offered by EPA on compliance with SBREFA. [3] Details on the data used in the economic impact analysis are found in the Appendix to this report.

A. Identifying and Characterizing Small Entities

For purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) a small as defined by the Small Business Administration's (SBA) regulations at 13 CFR 121.201;" (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

The companies owning the facilities using halogenated solvents can be grouped into small and large categories using Small Business Administration (SBA) general size standard definitions. Size standards are based on industry classification codes (i.e., NAICS) that each company uses to identify the industry or industries in which they operate in. The SBA defines a small business in terms of the maximum employment, annual sales, or annual energy-generating capacity (for EGUs) of the owning entity. These thresholds vary by industry and are evaluated based on the primary industry classification of the affected companies. In cases where companies are classified by multiple NAICS codes, the most conservative SBA definition (i.e., the NAICS code with the highest employee or revenue size standard) was used.

As mentioned earlier in this report, facilities across several industries use halogenated solvents to degrease their products, therefore a number of size standards are utilized in this analysis. For the industries represented in this analysis, the employment size standard varies from 500 to 1,500 employees. The annual sales standard is as low as 4 million dollars and as high as 150 million dollars. The specific SBA size standard is identified for each affected industry within the small entity database created for this economic analysis.

B. Screening-Level Analysis

For the purposes of assessing the potential impact of this rule on affected businesses, the Agency considers the costs of specific compliance options considered. The share of the facility's annual compliance cost relative to baseline sales for each facility-owning company is calculated

[3] The SBREFA compliance guidance to EPA rulewriters regarding the types of small business analysis that should be considered can be found at http://www.epa.gov/sbrefa/documents/rfafinalguidance06.pdf , pp. 24-25.

and this measure is used to determine the economic impact of these options on small businesses. When a company owns more than one facility that potentially faces the costs of complying with this standard, the costs for each facility it owns are summed to develop the numerator of the sales test ratio. For this screening-level analysis, annual compliance costs are defined as the engineering control costs incurred by these companies; thus, they do not reflect the changes in production expected to occur in response to the imposition of these costs and the resulting market adjustments.

EPA determined that 145 companies and the Federal government, own the 196 facilities that EPA identified as using halogenated solvents. The Federal government operates one of these facilities. This governmental jurisdiction is not considered a small entity. Employment and sales data were available for 110 of the companies (76 percent) and this information was used to classify the firms as small or large by SBA size standards. The small business analysis focuses on this subset of the companies owning facilities that use halogenated solvents. Of the 110 companies included in the analysis, 40 (someone more than one-third) are considered small. This number of companies reflect the scaled up solvent cleaner estimates that are shown earlier in this report (the scaling up factor of 1.734). We assume that the number of affected entities increases as the number of affected solvent cleaners increase as a result of the scaling up procedure described earlier.

Table 7 reports the summary statistics for the cost-to-sales ratios (CSRs) for small and large companies in this analysis. Note that this small business analysis includes only those companies for which data could be located. Therefore, the total annual compliance cost for these firms does not equal the total annual compliance cost estimated for the rule. Under the final standard, no significant impacts are anticipated for the affected small companies. None of the small entities affected by the final rule in this analysis has a CSR greater than 0.7 percent, and 29 of the 40 affected small entities are expected to experience zero costs or have cost savings. Finally, Table 8 provides a summary of the economic impacts to affected businesses under the final rule.

C. <u>Excluded Companies</u>

Annual sales and employment data could not be located for 35 of the companies (again, reflecting the scale up factor of 1.734) that use halogenated solvents and, as mentioned above, have been excluded from the analysis. Without these data, a size determination cannot be made for these companies nor could CSRs be calculated. Since it is more difficult to locate company data for small companies, it is possible that these companies are small. However, without sales and employment data, this cannot be determined with certainty. It is possible that these companies might be considered large, depending on the SBA size standard definition for their NAICS codes. It is important to note that only one of the excluded companies is expected to experience positive costs as a result of compliance with the final rule.

EPA has determined that the average cost facing excluded companies is approximately $-19,383 per company. This average cost savings is a greater savings than either the average costs facing the small companies (savings of $5,910) or the average cost savings experienced by the larger companies (savings of $14,700). Additionally, the maximum annual compliance costs faced by the excluded companies is approximately $68,000 while the maximum for the small companies is $29,700. For large companies, the maximum annual compliance cost is $68,000. Given this information, it is possible that these excluded facilities would not be affected any worse than the small companies included in this analysis.

Table 7. Summary Results for Economic Impact and Small Business Analysis for Halogenated Solvents Residual Risk – For Final Rule

	Small		Large		All Companies*	
Total Number of Companies in Analysis	40		85		125	
Estimated Annual Compliance Costs (2004$)	-$232,000		-$157,000		-$361,000	
	Number	Share	Number	Share	Number	Share
Companies in Analysis	40	100%	85	100%	125	100%
Compliance costs are 0% of sales or negative	16	20%	79	64%	95	49%
Compliance costs are > 0 to 1% of sales	24	80%	6	36%	30	51%
Compliance costs are > 1 to 3% of sales	0	0%	0	0%	0	0%
Compliance costs are > 3% of sales	0	0%	0	0%	0	0%
Compliance Cost-to-Sales Ratios						
Average	-0.04%		0.02%		0.02%	
Median	0.00%		0.01%		0.01%	
Minimum	-0.42%		-0.63%		-0.63%	
Maximum	0.67%		0.08%		0.67%	

*includes those companies for which sales and employment data could be located

Calculations are based on scale-up factor applied to affected source populations and costs (1.74).

Table 8. Summary of Economic Impacts

Final Rule	Number of Businesses Affected	Number of Small Businesses Affected	Impacts at 1% or Greater CSR – Small Businesses*	Small Businesses with Annualized Costs of Zero Percent or Having Cost Savings
60,000 Kg/yr MC equivalent + 100,000 Kg/yr MC equivalent for Military Maintenance Facilities	125	40	0	16

*includes those companies for which sales and employment data could be located

Calculations are based on scale-up factor applied to affected source populations and costs (1.734).

D. Small Business/Entity Impact Results

After considering the economic impacts of this final rule on small entities, we have concluded that this action will not have a significant economic impact on a substantial number of small entities. This certification is based on the economic impact of the final rule to affected small entities in the entire halogenated solvent cleaning source category. The final rule is expected to affect 125 ultimate parent entities that will be regulated as major sources based on inclusion of the scale-up factor of 1.734 applied to affected source populations and costs. Forty of the parent entities, or approximately one-third, are defined as small according to the relevant SBA small business size standards. None of the small firms has an annualized cost of more than 0.7 percent of sales associated with meeting the requirements for major sources, and 16 of the forty affected small firms are estimated to incur no costs or have cost savings associated with compliance with the final rule.

References

Hoover's Online, www.hooversonline.com .   Accessed in March, 2007.

Memo from Sorrels, Larry, U.S. EPA to Vogel, Ray, U.S. EPA. "Economic Data for Area Source Categories – Title V Permit Program Rulemaking," June 17, 2004.

Michael W. Horrigan, "Employment projections to 2012: concepts and context," *Monthly Labor Review* 127(2): 12, Bureau of Labor Statistics, February 2004.

Memo from Sarsony,Chris, engineering-environmental Management, Inc. to Dail, Lynn, U.S. EPA.   "National Cost Impacts." April 2007.

U.S. Environmental Protection Agency, Office of Policy, Economics, and Innovation.   "Final Guidance for EPA Rulewriters: Regulatory Flexibility Act as Amended by the Small Business Regulatory Enforcement Fairness Act," November 2006.

Thomas Manufacturing, www.ThomasNet.com .   Accessed in March, 2007.

Appendix – Construction of Database for Economic Impact and Small Business Analysis

This appendix provides a methodology and details of how the database used in the economic impact and small business analysis was constructed so that a reader can examine the database itself to understand why the particular data exists in that database and why it is used.

As mentioned in the body of the report, the economic impact analysis (EIA) prepared is a comparison of the annualized compliance costs for each parent entity affected under a particular regulatory option to the revenues for each parent entity. This comparison is loosely called a "cost-to-sales ratio." This EIA includes an analysis of affected small entities also; we identify the small parent entities affected in our analysis as described below. The analysis methodology and database construction is identical for all options considered.

The database used for preparing the EIA is constructed by following these steps:

1) Identification of affected facilities. The engineering contractor to the Sector Policies and Programs Division (SPPD), engineering environmental Inc., identified a list of affected halogenated solvent cleaning facilities under each regulatory option analyzed. This list of facilities reflects facilities with one or more solvent cleaners identified as affected under a particular regulatory option. The contractor made this list of facilities available to the economist preparing this report. This list of facilities was made available in a Microsoft Excel spreadsheet, and this spreadsheet prepared by the engineering contractor is available in the rule docket.

2) Identification of affected parent entity. Each facility identified in the list of affected facilities had its name listed. This name, however, does not necessarily identify the parent entity of the affected facility. The economist on this project collected information from various data sources identified earlier in this report to determine what parent entity owned each identified affected facility. In most cases, the parent entity owning an affected facilities is a privately owned firm, but there are a few facilities affected that are government-owned. Once the parent entity for an affected facility is identified, it was included beside the facility name for the affected facility. We were unable to identify the parent entity for each affected facility; however, as mentioned earlier in this report, we were able to identify the parent entity for each affected entity nearly 75 percent of the time.

3) Revenue and employment data for each affected parent entity. We collected revenue data for the most recent fiscal year for each affected parent entity, and we collected this data from the same data sources identified earlier in this report. We also collected employment data for each affected parent entity from most of these same data sources. We collect the employment data in order to determine if the affected entity is "small" as defined by Small Business Administration (SBA) size standards. The SBA size standards relevant to this analysis are defined earlier in this report. These size standards are defined by

6-digit North American Industry Classification System (NAICS) code. Part of the data that Engineering Environmental, Inc. supplied was the NAICS for each affected facility. We use this NAICS to assign an SBA small business size standard to each affected parent entity.

4) Annualized compliance costs for each affected facility and parent entity. Engineering Environmental, Inc. prepared capital and annualized compliance cost estimates for each affected solvent cleaner under each regulatory option. These compliance cost estimates include the annualized cost of capital, operating and maintenance cost, and monitoring, recordkeeping, and reporting costs. We summed up the solvent cleaner costs by facility to obtain the facility-level cost estimate and then summed up the facility-level cost estimates to obtain parent entity-level estimates. Costs are in 2004 dollars to match the year dollars for our revenue data (2004 data).

After completion of these 4 steps, we incorporated this data into a spreadsheet. There is therefore a spreadsheet with a tab for annualized cost, revenue, and employment for each identified affected parent entity identified as affected by the final rule according to our analysis. Identification of a parent entity as small or large is included as appropriate in each tab. This spreadsheet is available in the public rule docket with the following file name:

*Smallbusinessanalysis60000MCoptionwithrevenueshalogsolvfinal.xls – Spreadsheet with all data used in the economic impact analysis for the final rule.

United States Environmental Protection Agency	Office of Air Quality Planning and Standards Health and Environmental Impacts Division Research Triangle Park, NC	Publication No. EPA 452/R-07-005 April 2007