Economic Impact Analysis of the Proposed Halogenated Solvent Cleaners Residual Risk Standard

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Executive Summary

The EPA is proposing a revised standard to reduce the amount of risk associated with exposure to 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 to reduce such emissions. The proposed 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 proposed standard. We provide economic impacts for six different regulatory options considered for the proposal. Two of these options will be proposed as part of 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 except for the most stringent scenario (known as Regulatory Option 6), and that large businesses should experience cost savings for the most part. We find that small firms are 66 percent of the businesses affected under each of the options considered in this analysis. These impacts range from only 5 firms (4 small) out of 281 (186 small) having some positive cost to sales estimate for the least stringent option (known as Regulatory Option Scenario 1) to 146 firms (124 small) that have some positive cost to sales estimate, with 8 small firms out of these 124 having annualized compliance costs of greater than 3 percent of sales. For the proposed options, Regulatory Option Scenarios 3 and 4, the impacts range from 9 firms (6 small) that have some positive cost to sales estimate to 38 firms (32 small) that have a positive cost to sales estimate. There is no significant economic impact on a substantial number of small entities (or SISNOSE) under either of the proposed options.

Introduction

The EPA is proposing revised standards 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 proposing 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. The proposed 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 a facility-wide MC, PCE and TCE emission standards.

Profile of Affected Industries

Halogenated solvent cleaners are found in NAICS codes 332999, 337124, 335999, 336999, 332116, 336, 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).

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 these industries are found in 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

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 – process background

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 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. 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 MACT. 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 97 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 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 proposed 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 July 2007.

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 August, 2007.

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 September 2006.

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 is currently reassessing the cancer classification of trichloroethylene.

II. Summary of the Proposed Rule Requirements

A. Proposed requirements for major and area sources

Under the proposed amendments, the requirements for all new and existing, major and area sources are the same. The proposed revisions would require each facility to comply with a facility-wide solvent emissions limit. The proposed emissions limits are 40,000 kg/yr (kilograms/year) MC-equivalent applied facility-wide and 25,000 kg/yr MC-equivalent applied facility-wide. The facility-wide solvent emissions limit requires that the owner or operator of each facility ensure that the combined emissions of PCE, TCE, and MC from all of the solvent cleaning machines at the facility be less than or equal to the solvent emission levels specified in the proposed amendments and summarized in Table 2. This approach gives the owner or operator of the facility the flexibility to choose any means of reducing the facility-wide emissions of PCE, TCE, and MC to complying with facility-wide emissions limits. The proposed amendments are in addition to the existing NESHAP requirements, and therefore, all requirements of the existing NESHAP remain in place.

Table 2 shows data for the facility-wide emission limits. We are proposing both of these options and are soliciting comment on which of these two options is most appropriate. As can be seen in Table 2, each halogenated solvent has an associated facility-wide emission limit. These limits are for facilities that only emit that halogenated solvent. If more than one halogenated solvent is used, the owner or operator of the facility must calculate the facility's weighted emissions using equation 1 and comply with the limit in the last row of Table 2.

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

Solvents Emitted	Proposed Facility-Wide Annual Emission Limits in kg(lb) - Option 1	Proposed Facility-Wide Annual Emission Limits in kg(lb) - Option 2
PCE only	2,083 (4,593)	3,333 (7,349)
TCE only	6,250 (13,779)	10,000 (22,046)

MC only	25,000 (55,115)	40,000 (88,183)
Multiple solvents – Calculate the weighted emissions using equation 1	25,000 (55,115)	40,000 (88,183)

Equation 1:
(lbs of PCE emissions x 12)+(lbs of TCE emissions x 4) + (lbs of MC emissions) = Weighted Emissions in lbs

There is no additional equipment monitoring or work practice requirements associated with the facility-wide annual emissions limit. Compliance with the emission limit is demonstrated by determining the annual PCE, TCE, and MC emissions for all cleaning machines at the facility. This is 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. Reporting requirements include an initial notification report, an initial statement of compliance report, annual compliance reports, and an exceedance report (required only when an exceedance occurs).

III. Rationale for the Proposed Rule

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

Following our initial determination that the individual most exposed to emissions from the category considered exceeds a 1-in-1 million individual cancer risk, our approach to developing residual risk standards is based on a two-step determination of acceptable risk and ample margin of safety. The first step, consideration of acceptable risk, is only a starting point for the analysis that determines the final standards. The second step determines an ample margin of safety, which is the level at which the standards are set.

B. How did we estimate residual risk?

Cancer and noncancer health impacts caused by environmental exposures generally cannot be isolated and measured directly. Even if it were possible to do so, we would not be able to use measurements to assess the impacts of future or alternative regulatory control strategies. As a result, modeling-based risk assessment is used as a tool to estimate health risks for many

EPA programs. In risk assessments, there are many possible levels of analysis from the most basic screening approach to the more refined, detailed assessment.

C. <u>What did we analyze in the risk assessment?</u>

Three sources of data were used to characterize the source for the residual risk assessment, EPA's 1999 NEI database, a sample of MACT compliance reports obtained from states and EPA regions, and information compiled from Clean Air Act Title V permits. Together, these sources provided data for 2,672 unique cleaning machines at 1,167 unique facilities. The 1,167 facilities represent approximately 61 percent of the 1,900 total facilities estimated to be in the source category.

The majority of the data, approximately 90 percent, were obtained from the 1999 NEI database. The NEI data provided information for 2,672 emission points at 1,093 facilities. The types of data obtained from the NEI database include machine type (from SCC codes and unit descriptions), HAP emissions data, and stack characteristics. The compliance reports collected for the residual risk assessment provided information for 195 cleaning machines at 96 facilities. The types of data obtained from the compliance report include machine types, machines sizes, solvent consumption rates, HAP emissions data, compliance options, and control equipment choices. We gathered machine-specific data for continuous web cleaning machines from Title V permits and other sources. These data, which included 74 cleaning machines at seven facilities, were added to the cleaning machine data obtained from compliance reports.

Halogenated solvent cleaning machines are co-located with many and diverse types of industries. An analysis of MACT source category codes in the 1999 NEI data found that approximately 74 percent of the 1,093 halogenated solvent cleaning sources in our database are co-located with at least one other source category. Approximately 80 percent of the halogenated solvent emissions from solvent cleaning machines occurred at facilities where other source categories appeared to be co-located. However, the risk assessment evaluated the emissions coming from the degreasing operations only and did not consider emissions of HAPs that were identified for co-located, non-degreasing operations.

The residual risk assessment used HAP emissions data from the assessment database described above. The database contains a mix of actual and allowable post-MACT emission rates. These data were used to estimate the baseline residual risks and to evaluate regulatory options developed to look at further HAP emission reductions.

D. How we assessed environmental impacts

Although the risk assessment focuses on estimating potential risks to humans, we are also required to consider adverse impacts to the environment as a part of a residual risk assessment. To ensure that no adverse effects to wildlife (including birds) result from emissions of HAPs from this source category, we carried out an assessment of ecological effects via inhalation toxicity. Maximum long-term air concentrations of HAPs at the most exposed census block centroid were used as the exposure concentrations, and estimated exposure concentrations, and estimated exposure concentrations were compared to conservative ecological toxicity screening values.

Because none of the source category HAPs are considered to be persistent and bioaccumulative compounds, we expect risks to wildlife via ingestion and other non-inhalation routes and risks to non-terrestrial animals to be insignificant. In addition, the majority (over 99 percent) of the mass of PCE, TCE, 1,1,1,-TCA, and MC will partition preferentially to air rather than water, soil, or sediment, providing further evidence that non-inhalation toxicity to ecological receptors is of little concern.

E. Results of the risk assessment

The baseline residual risk assessment for the halogenated solvent cleaning source category used HAP emissions data from an assessment database that included 1,167 sources. This assessment database represents approximately 61 percent of the 1,900 facilities in the source category. Estimates of maximum individual cancer risk and chronic non-cancer HI were calculated for each facility. Results presented in this section have been scaled-up proportionally to reflect results for the 1,900 facilities in the source category.

Table 3 summarizes the estimated lifetime cancer risk results. The table shows the number of persons in the population and the number of halogenated solvent cleaning facilities that are associated with various levels of lifetime cancer risk. The highest risk to an individual living in the vicinity of one of the halogenated solvent cleaning facilities (the maximum individual risk) is 200 in-a-million. For the population, the number of people with risks greater than or equal to one in-a-million is approximately 5,900,000 people with 86 of these exposed to risks greater or equal to 100 in-a-million. These risks correspond to an annual cancer incidence of 0.4.

Table 3. - Population Risk Distribution and Number of Facilities at Various Levels of Maximum Risk – Baseline (Scaled to National Level)[1]

Estimated Lifetime Cancer Risk (in-a-million)	National-scale Population[2,3]	Number of Facilities in the Source Category at the Estimated Risk Level[4]
≥ 100	86	7
≥ 10 to < 100	42,000	117
≥ 1 to < 10	5,900,000	415
< 1 or no cancer risk (i.e., emit non-carcinogen only)	-	1,361[5]
Total	5,942,086	1,900

[1] Represents the estimated numbers of people residing in census blocks with concentrations associated with risks at the designated risk level.
[2] National-scale population estimated for this source category by multiplying the populations at the specified cancer risk level by 1,900/1,167. Population counts have been rounded.
[3] These population numbers reflect adjustments in population risk due to residency time variations.
[4] Estimated by multiplying the number of sources at the specified cancer risk level (in Table B-1) by 1,900/1,167.
[5] Calculated as 671 (sources at < 1 in-a-million risk) plus 690 (sources that emit 1,1,1-TCA only).

We also evaluated potential risks for adverse health effects other than cancer. Calculated chronic non-cancer HIs were below 1 for all 1,167 facilities included in the risk assessment. The highest HI was estimated to be 0.2. Given these results, it is expected that chronic non-cancer HIs would be below 1 for all 1,900 facilities in the source category.

The calculation of the aggregate non-cancer hazard may be described for multiple substances in terms of the Target Organ Specific Hazard Index (TOSHI). The TOSHI represents the sum of HQs for individual air toxics that affect the same organ or organ system.

An ecological screening assessment for potential terrestrial receptors was conducted to determine if there were any potentially significant ecological effects that warranted a more refined level of analysis. Maximum long-term air concentrations of HAPs at the most exposed census block centroid were used as the exposure concentrations, and estimated exposure concentrations were compared to conservative ecological toxicity screening values. Calculated hazard quotients associated with terrestrial ecological receptors were well below 1 for all HAPs at all facilities. Because of the health-protective assumptions used in this assessment, it is believed that the ecological screening values developed would also be protective of terrestrial ecological receptors that are threatened or endangered.

F. Regulatory Scenarios

Six scenarios were developed to evaluate reductions in residual risk if post-MACT emissions were controlled further. The scenarios are not based on specific emission control technologies or practices, but represent regulatory options that require capping emissions at specific levels. As mentioned in this report, these scenarios are based on a range of maximum facility-level emissions rates. Emission rates for the scenarios were developed from baseline emission data in the assessment sample. To estimate emissions rates for a scenario, the baseline post-MACT emissions rates were capped by scenario-specific maximum annual emission rates. By comparing the results across the scenarios, the relationship between risk reductions and the number of facilities affected may be evaluated.

For Regulatory Option Scenario 1, EPA assumed that technologies or practices implemented for further post-MACT control of HAP emissions would result in each facility emitting no more than 100,000 kg/yr (220,000 lbs/yr) of MC-equivalent HAP. Each of the six evaluated regulatory scenarios are summarized below.

- **Regulatory Option Scenario 1** -- Assumes that all sources would reduce MC-equivalent emissions to no more than 100,000 kg/yr (220,000 lbs/yr).
- **Regulatory Option Scenario 2** -- Assumes that all sources would reduce MC-equivalent emissions to no more than 60,000 kg/yr (132,000 lbs/yr).
- **Regulatory Option Scenario 3** -- Assumes that all sources would reduce MC-equivalent emissions to no more than 40,000 kg/yr (88,000 lbs/yr).
- **Regulatory Option Scenario 4** -- Assumes that all sources would reduce MC-equivalent emissions to no more than the 25,000 kg/yr (55,000 lbs/yr).
- **Regulatory Option Scenario 5** -- Assumes that all sources would reduce MC-equivalent emissions to no more than 15,000 kg/yr (33,000 lbs/yr).
- **Regulatory Option Scenario 6** -- Assumes that all sources would reduce MC-equivalent emissions to no more than 6,000 kg/yr (13,200 lbs/yr).

An example of how these options work in practice is the following. Under control option

5, each facility must limit the total combined emissions of PCE, TCE, and MC in kg to 60,000 kg MC equivalent. So for a facility that emits 4,000 kg of PCE, 2,000 kg of TCE, and 10,000 kg or MC the MC equivalent emission would be determined as follows:

MC equivalent emissions in kg
= (4,000 kg emissions of PCE x 12) + (2,000 kg of TCE x 4) + (10,000 kg of MC)
= 48,000 kg + 8,000 kg + 10,000 kg
= 66,000 kg

Therefore, this facility is 6,000 kg MC equivalent over the limit in Regulatory Option Scenario 5. To comply with the limit the facility could change practices or apply controls to do the following:

1. Reduce PCE emissions by 500 kg,
2. Reduce TCE emissions by 1,500 kg,
3. Reduce MC emissions by 6,000 kg,
4. Or any combination of reducing PCE, TCE, and MC emissions where:
   (PCE emissions reduction in kg x 12) + (TCE emissions reduction in kg x 4) + (MC emissions reduction in kg) = 6,000 kg or more

Establishing the control options on a facility-wide basis allows each facility the flexibility to comply in the most cost effective manner. This is because each facility can choose which units to control, which controls to apply, and which solvents to control so long as the limit is met.

G. Impacts for Each Option

Table 4 shows that the decrease in maximum individual risk ranges from 75% with Regulatory Option 1 (i.e., from 200 in-a-million baseline to 50 in-a-million) to 99% with Option 6 (i.e., from 200 in-a-million baseline to 3 in-a-million). The corresponding annual incidence estimates decrease over the range from 35 percent for Option 1 to 90 percent for Option 6. Likewise, there are large shifts in the number of people with risks greater than or equal to one in-a-million to below one in-a-million. The reduction in population with risks greater than or equal to one in-a-million ranges from 66% for Option 1 to over 99 percent for Option 6.

Table 5 presents the number of facilities at estimated cancer risk levels for the regulatory option scenarios. Baseline results are provided for comparison. Numbers represent national-scale estimates (i.e., the numbers of facilities were scaled by a factor of approximately 1.6).

Table 4 - Cancer Risk Results – Baseline vs. Regulatory Option Scenarios (Scaled to National Level)

Cancer Risk Results	Baseline	Regulatory Options (max MC equivalent emissions in kg/yr)					
	(no control)	Option 1 100,000	Option 2 60,000	Option 3 40,000	Option 4 25,000	Option 5 15,000	Option 6 6,000
Maximum Individual Risk (in-a-million)	200	50	30	20	10	8	3
Annual Incidence	0.40	0.26	0.21	0.17	0.13	0.09	0.04
Estimated Lifetime Cancer Risk (in-a-million)	Estimated National Population [1,2]						
≥ 1 to < 10	5,900,000	2,000,000	1,200,000	630,000	200,000	200,000	8,200
≥ 10 to < 100	42,000	5,100	1,400	700	67	0	0
≥ 100	86	0	0	0	0	0	0
Total Population at ≥ 1	5,942,086	2,005,100	1,201,400	630,700	200,067	200,000	8,200

Notes:
1. National population estimated for this source category by multiplying the populations at the specified cancer risk level by 1,900/1,167. Population counts for the individual risk bins have been rounded to two significant figures.
2. These population numbers reflect adjustments in population risk due to residency time variations.

Table 5 - Number of Facilities at Various Levels of Risk – Baseline vs. Regulatory Option Scenarios (Scaled to National Level)

Estimated Lifetime Cancer Risk (in-a-million)	Number of Facilities in the Source Category at the Estimated Risk Level [1]						
	Baseline	Regulatory Options (max MC equivalent emissions in kg/yr)					
	(no control)	Option 1 100,000	Option 2 60,000	Option 3 40,000	Option 4 25,000	Option 5 15,000	Option 6 6,000
≥ 100	7	0	0	0	0	0	0
≥ 10 to < 100	117	85	57	29	7	0	0
≥ 1 to < 10	415	453	477	501	492	461	239
< 1 or no cancer risk (i.e., facilities emit non-carcinogen	1,361	1,362	1,366	1,369	1,402	1,439	1,660

only)[2]							

Notes:

1. Estimated by multiplying the number of facilities at the specified cancer risk level by 1,900/1,167.
2. Calculated as facilities at < 1 in-a-million risk plus 690 (facilities that emit 1,1,1-TCA only).

We acknowledge that there are uncertainties in various aspects of risk assessment due to the use of some modeling and exposure assumptions. Specific possible uncertainties in the risk assessment include: the size of the source category, use of actual versus allowable emissions, lack of source specific data on peak emissions, and modeling uncertainties (e.g., meteorology, emission point locations, release parameters, urban versus rural dispersion, population size and exposure, co-location issues, and dose response values). Given the possible impacts of the assumptions and modeling parameters used in this assessment, it is reasonable to assume that overall, this assessment is not likely to over- or underestimate risks preferentially and that the results presented are a reasonable, best estimate of risks to both the individual maximally exposed and the population.

We determined that a risk-based emission limit on the highest risk sources would provide an opportunity for additional control that would be achievable and reasonable. We believe that halogenated solvent cleaning facilities, subject to the emission limit, can achieve the proposed limits at a reasonable cost if not actually incurring a cost savings. Both co-proposed emission limits would provide an ample margin of safety to protect public health and the environment.

II. Costs for 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 (Table 6). 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 6 . 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)	0.5	$25,645	$2,821	$2,015	$4,836
	1.5 Freeboard Ratio (1.5FBR)	0.3	$20,380	$2,242	$0	$2,242
Solvent Switching	PCE to MC	0.93	$15,677	$1,725	$928	$2,653
	PCE to TCE	0.77	$0	$0	($2,022)[b]	($2,022)
	TCE to MC	0.7	$15,677	$1,725	$2,950	$4,675
Machine Replacement	Vacuum to Vacuum Cleaning Machine	0.97	$399,000	$37,663	$0	$37,663

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.

The costs for the retrofit controls were based on vendor estimates obtained in 2005. 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 percent emission reductions 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 scaled to 2004 dollars and were annualized assuming a 15-year equipment lifetime 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."

Costs for the vacuum-to-vacuum cleaning machines are based on vendor estimates obtained in 2005. 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 97% 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%, 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.

III. <u>Number of Affected Solvent Cleaners Per Regulatory Option</u>

This section presents the number of solvent cleaners affected, and the costs and emission reductions expected for each option. Both capital and annualized costs are estimated. First, we show the number of affected solvent cleaners in Table 7.

TABLE 7: NUMBER OF SOLVENT CLEANERS SUBJECT TO CONTROL AND NOT SUBJECT TO CONTROL FOR EACH OF THE SIX COMPLIANCE OPTIONS

Group of Solvent Cleaners	100,000 Kg MC #	% of Grand Total	60,000 Kg MC		40,000 Kg MC		25,000 Kg MC		15,000 Kg MC		6,000 Kg MC	
Total for Solvent Cleaners in NEI Subject to Control to Meet Residual Risk Option	153	9	251	15	378	23	486	29	621	37	852	51
Total for Solvent Cleaners in NEI Not Subject to Control to Meet Residual Risk Option	1504	91	1407	85	1280	77	1172	71	1037	63	805	49
Grand Total of Solvent Cleaners in NEI	1658	100	1658	100	1658	100	1658	100	1658	100	1658	100

TABLE 8: NUMBER OF UNITS ASSIGNED TO EACH CONTROL OPTION FOR EACH OF THE SIX COMPLIANCE OPTIONS

Control Option	100,000 kg MC #	% of Total Controlled	60,000 kg MC #	% of Total Controlled	40,000 kg MC #	% of Total Controlled	25,000 kg MC #	% of Total Controlled	15,000 kg MC #	% of Total Controlled	6,000 kg MC #	% of Total Controlled
Vacuum	51	33	73	29	116	31	187	39	289	46	468	55
PCE to MC	8	5	16	6	24	6	28	6	33	5	41	5
PCE to TCE	24	16	26	10	26	7	47	10	60	10	64	7
TCE to MC	29	19	54	21	65	17	72	15	77	12	117	14
Retro – 1.5 FBR, WC, FRD	23	15	23	9	73	19	73	15	103	17	77	9
Retro – 1.5 FBR	18	12	59	23	73	19	78	16	60	10	86	10
Total for Units in NEI Subject to Residual Risk Standard	153	100	251	100	378	100	486	100	621	100	852	100

Cost and Emission Reductions by Regulatory Option

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 9 shows that half of the units using TCE, PCE, or MC are subject to control beyond MACT at the 6,000 kg MC equivalent option. About 9% of the units using TCE, PCE, or MC are subject to control beyond MACT at the 100,000 kg MC equivalent option. The lower the limit is established, the greater the number of units that must be controlled to achieve the limit. Emission reductions are greater the lower the limit is established, therefore, the solvent savings are greater.

Table 10 shows the HAP emission reductions by each regulatory option. Emission reductions range from 4,031 tons per year for the 100,000 kg MC equivalent option to 8,595 tons per year for the 6,000 kg MC equivalent option. At the 100,000 option emissions of PCE, TCE and MC are reduced by 41%. At the 6,000 option emissions of PCE, TCE and MC are reduced by 87%.

Tables 11-16 provide the costs for each regulatory option broken down by capital and annual components and including estimates of the cost savings from solvent recovery. Table 17 provides a summary of these costs as well as emission reductions for each option. Total annual emission control costs range from a savings of $6 million/year for the 40,000 kg and the 60,000 kg MC equivalent control options to a cost of $2 million/year for the 6,000 kg MC control option. Capital costs for the six control options range from approximately $22 million for the 100,000 kg MC equivalent option to $193 million for the 6,000 kg MC equivalent option. Annualized capital costs range from $2 million/year for the 100,000 kg MC equivalent option to $18 million/year for the 6,000 kg MC equivalent option. Operating and maintenance costs are a small portion of the overall costs, ranging from $90K for the 100,000 kg MC equivalent option to $410K for the 6,000 kg MC equivalent option. Solvent savings have a significant impact on total annual costs, ranging from a savings of over $16 million/year for the 6,000 kg MC option to a savings of over $7 million/year for the 100,000 kg MC equivalent option. Solvent savings represent the cost savings that result from reduced solvent purchases.

Incremental costs are negative for the 100,000 kg and the 60,000 kg MC equivalent options at ($1,292)/ton and ($826)/ton, respectively. Incremental costs for the remaining four options are positive and range from $16/ton for the 40,000 kg MC equivalent option to

$5,554/ton for the 6,000 kg MC equivalent option.

TABLE 9: EMISSION REDUCTIONS IN TONS BY CONTROL OPTION FOR EACH OF THE SIX COMPLIANCE OPTIONS

Control Option	100,000 kg MC Tons	%	60,000 kg MC Tons	%	40,000 kg MC Tons	%	25,000 kg MC Tons	%	15,000 kg MC Tons	%	6,000 kg MC Tons	%
Vacuum	1,843	77	2,322	77	2,907	80	3,401	82	4,054	86	4,663	88
PCE to MC	225	9	225	7	268	7	285	7	282	6	296	6
PCE to TCE	52	2	22	1	3	0	47	1	8	0	9	0
TCE to MC	35	1	159	5	91	3	131	3	118	3	181	3
Retro – 1.5 FBR, WC, FRD	238	10	125	4	238	7	174	4	190	4	69	1
Retro – 1.5 FBR	85	3	155	5	123	3	124	3	56	1	54	1
Total Emission Reductions	2,477	100	3,009	100	3,630	100	4,161	100	4,709	100	5,272	100
Total Percent Reduction		41		50		60		69		78		87

TABLE 10: EMISSION REDUCTIONS IN TONS BY HAP FOR EACH OF THE SIX COMPLIANCE OPTIONS

HAP	100,000 kg MC		60,000 kg MC		40,000 kg MC		25,000 kg MC		15,000 kg MC		6,000 kg MC	
	Emission Reduction (Tons)	%	Emission Reduction (Tons)	%	Emission Reduction (Tons)	%	Emission Reduction (Tons)	%	Emission Reduction (Tons)	%	Emission Reduction (Tons)	%
MC	439	18	453	15	524	14	602	14	699	15	849	16
TCE	1053	43	1,470	49	1,931	53	2,316	56	2,720	58	3,091	59
PCE	984	40	1,086	36	1,174	32	1,243	30	1,290	27	1,332	25
Total	2,477	100	3,009	100	3,629	100	4,161	100	4,709	100	5,272	100

Table 11. Costs by Regulatory Option Scenario – 100,000 kg MC Limit

Control Option	Total Capital Costs	Annualized Capital Costs	O&M Costs	Solvent Savings	Total Annualized Control Costs
Vacuum	$20,161,470	$1,903,100	$0	($5,433,333)	($3,530,233)
PCE to MC	$127,768	$14,059	$7,563	($481,481)	($459,859)
PCE to TCE	$0	$0	($49,438)	($263,129)	($312,567)
TCE to MC	$459,963	$50,612	$86,553	($119,508)	$17,656
Retro – 1.5 FBR, WC, FRD	$585,222	$64,375	$45,977	($796,033)	($685,682)

Retro – 1.5 FBR	$365,413	$40,195	$0	($278,448)	($238,253)
Total Costs	$21,699,836	$2,072,341	$90,655	($7,371,932)	($5,208,937)

Table 12. Costs by Regulatory Option Scenario – 60,000 kg MC Emissions Limit

Control Option	Total Capital Costs	Annualized Capital Costs	O&M Costs	Solvent Savings	Total Annualized Control Costs
Vacuum	$28,616,280	$2,701,175	$0	($7,005,153)	($4,303,979)
PCE to MC	$255,535	$28,118	$15,126	($489,844)	($446,600)
PCE to TCE	$0	$0	($52,734)	($187,632)	($240,366)
TCE to MC	$843,266	$92,788	$158,681	($547,817)	($296,349)
Retro – 1.5 FBR, WC, FRD	$585,222	$64,375	$45,977	($388,591)	($278,240)
Retro – 1.5 FBR	$1,195,898	$131,549	$0	($495,219)	($363,670)
Total Costs	$31,496,202	$3,018,003	$167,050	($9,114,256)	($5,929,203)

Table 13. Costs by Regulatory Option Scenario – 40,000 kg MC Emissions Limit

Control Option	Total Capital Costs	Annualized Capital Costs	O&M Costs	Solvent Savings	Total Annualized Control Costs
Vacuum	$46,176,270	$4,358,714	$0	($8,930,369)	($4,571,655)
PCE to MC	$383,303	$42,176	$22,690	($588,814)	($523,948)
PCE to TCE	$0	$0	($52,734)	($112,536)	($165,269)
TCE to MC	$1,022,140	$112,470	$192,340	($317,482)	($12,672)
Retro – 1.5 FBR, WC, FRD	$1,881,072	$206,918	$147,782	($747,995)	($393,295)
Retro – 1.5 FBR	$1,494,873	$164,436	$0	($410,267)	($245,831)
Total Costs	$50,957,658	$4,884,714	$310,078	($11,107,463)	($5,912,671)

Table 14. Costs for Regulatory Option Scenario – 25,000 kg MC Emissions Limit

Control Option	Total Capital Costs	Annualized Capital Costs	O&M Costs	Solvent Savings	Total Annualized Control Costs
Vacuum	$74,792,550	$7,059,888	$0	($10,551,077)	($3,491,189)
PCE to MC	$434,410	$47,800	$25,715	($632,344)	($558,830)
PCE to TCE	$0	$0	($95,580)	($217,536)	($313,116)
TCE to MC	$1,124,354	$123,717	$211,574	($451,594)	($116,303)
Retro – 1.5 FBR,	$1,881,072	$206,918	$147,782	($563,841)	($209,141)

WC, FRD					
Retro – 1.5 FBR	$1,594,531	$175,398	$0	($397,072)	($221,674)
Total Costs	$79,826,917	$7,613,721	$289,491	($12,813,464)	($4,910,252)

Table 15. Costs by Regulatory Option Scenario- 15,000 kg MC Emissions Limit

Control Option	Total Capital Costs	Annualized Capital Costs	O&M Costs	Solvent Savings	Total Annualized Control Costs
Vacuum	$115,115,490	$10,866,089	$0	($12,633,199)	($1,767,110)
PCE to MC	$511,070	$56,235	$30,253	($640,937)	($554,449)
PCE to TCE	$0	$0	($121,947)	($114,124)	($236,070)
TCE to MC	$1,201,015	$132,152	$226,000	($408,980)	($50,828)
Retro – 1.5 FBR, WC, FRD	$2,633,500	$289,685	$206,895	($608,895)	($112,315)
Retro – 1.5 FBR	$1,229,118	$135,203	$0	($174,430)	($39,227)
Total Costs	$120,690,193	$11,479,364	$341,200	($14,580,565)	($2,760,000)

Table 16. Costs by Regulatory Option Scenario - 6,000 kg MC Emissions Limit

Control Option	Total Capital Costs	Annualized Capital Costs	O&M Costs	Solvent Savings	Total Annualized Control Costs
Vacuum	$186,656,190	$17,619,025	$0	($14,578,221)	$3,040,804
PCE to MC	$638,838	$70,294	$37,816	($677,961)	($569,851)
PCE to TCE	$0	$0	($128,539)	($101,923)	($230,461)
TCE to MC	$1,839,853	$202,446	$346,212	($624,155)	($75,497)
Retro – 1.5 FBR, WC, FRD	$1,964,675	$216,115	$154,350	($220,303)	$150,161
Retro – 1.5 FBR	$1,760,628	$193,669	$0	($156,172)	$37,498
Total Costs	$192,860,184	$18,301,548	$409,839	($16,358,735)	$2,352,653

Table 17. Summary Table of Costs and Emission Reductions by Regulatory Option Scenario

Compliance Option	Total Capital Costs	Annualized Capital Costs	O&M Costs	Solvent Savings	Total Annualized Control Costs	Emissions Reductions (Tons)
100,000 kg MC	$21,699,836	$2,072,341	$90,655	($7,371,932)	($5,208,937)	4,031
60,000 kg MC	$31,496,202	$3,018,003	$167,050	($9,114,256)	($5,929,203)	4,903
40,000 kg MC	$50,957,658	$4,884,714	$310,078	($11,107,463)	($5,912,671)	5,911
25,000 kg MC	$79,826,917	$7,613,721	$289,491	($12,813,464)	($4,910,252)	6,778
15,000 kg MC	$120,690,193	$11,479,364	$341,200	($14,580,565)	($2,760,000)	7,675
6,000 kg MC	$192,860,184	$18,301,548	$409,839	($16,358,735)	$2,352,653	8,595

III. Economic Impact and Small Business Analysis

The residual risk standards being proposed 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 proposed 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.

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 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.

B. <u>Screening-Level Analysis</u>

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 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 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 360 companies, the Federal government, and the government of the District of Columbia own the 400 facilities that EPA identified as using halogenated solvents. The Federal government operates nine of these facilities while the District of Columbia operates one. Neither of these governmental jurisdictions are considered small entities. Employment and sales data were available for 281 of the companies (78 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 281 companies included in the analysis, 181 (approximately 64 percent) are considered small.

Tables 18-23 report the summary statistics for the cost-to-sales ratios (CSRs) for small and large companies in this analysis. Table 20 contains the impacts for the 40,000 kg/yr MC-equivalent regulatory option scenario and Table 21 contains the impacts for the 25,000 kg/yr MC-equivalent regulatory option scenario; these are the options co-proposed in this regulatory action. The compliance costs estimated for these companies are also provided. 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 proposed options, there are no significant impacts anticipated for the small companies. The firms in this analysis with cost-to-sales ratios that exceed three percent do not tend to face higher annual compliance costs, but rather earn lower annual revenue than the other small businesses. These impacts for the proposed options, Regulatory Option Scenarios 3 and 4, range from only 5 firms (4 small) out of 281 (186 small) having some positive cost to sales estimate for the least stringent option (known as Regulatory Option Scenario 1) to 146 firms (124 small) that have some positive cost to sales estimate, with 8 small firms out of these 124 having annualized compliance costs of greater than 3 percent of sales. For the proposed options, the impacts range from 9 firms (6 small) that have some positive cost to sales estimate to 38 firms (32 small) that have a positive cost to sales estimate. Only one small business affected by the proposed options in this analysis has a CSR greater than three percent and only three have a CSR above one percent. Finally, Table 24 provides a summary of the economic impacts to affected businesses across the six options.

C. Excluded Companies

Annual sales and employment data could not be located for 91of the 360 companies 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 31 of the excluded companies are expected to experience cost savings as a result of this control option.

EPA has determined that the average cost facing excluded companies is approximately $454 per company. This average cost is much closer to zero than either the average costs facing the small companies ($9,200) or the average cost savings experienced by the larger companies (savings of $2,300). Additionally, the maximum annual compliance costs faced by the excluded companies is approximately $41,000 while the maximum for the small companies is $77,000. For large companies, the maximum cost is $179,000. 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 18. Summary Results for Small Business Analysis for Halogenated Solvents Residual Risk - Regulatory Option Scenario 1 (100,000 kg/yr MC)

	Small		**Large**		**All Companies***	
Total Number of Companies in Analysis	186		95		281	
Estimated Annual Compliance Cost Savings (2004$)	-$891,780		-$1,482,173		-$2,373,953	
	Number	Share	Number	Share	Number	Share
Companies in Analysis	186	100%	95	100%	281	100%
Compliance costs are 0% of sales or negative	182	98%	94	98%	276	86%
Compliance costs are > 0 to 1% of sales	4	2%	1	2%	5	13%
Compliance costs are > 1 to 3% of sales	0	0%	0	0%	0	1%
Compliance costs are > 3% of sales	0	0%	0	0%	0	0%
Compliance Cost-to-Sales Ratios						
Average	0.00%**		0.00%		0.01%	
Median	0.00%		0.00%		0.01%	
Minimum	-0.71%		-0.01%		-0.71%	
Maximum	0.41%		0.01%		0.41%	

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

** the value 0.00% denotes impacts that are 0.005% and below

Table 19. Summary Statistics for Small Business Analysis for Halogenated Solvents Residual Risk Regulatory Option Scenario 2 (60,000 kg/yr MC)

	Small		**Large**		**All Companies***	
Total Number of Companies in Analysis	181		98		279	
Estimated Annual Compliance Cost Savings (2004$)	-$696,465		-$2,065,490		-$2,761,955	
	Number	Share	Number	Share	Number	Share
Companies in Analysis	181	100%	98	100%	279	100%
Compliance costs are 0% of sales or negative	178	98%	96	98%	274	98%
Compliance costs are > 0 to 1% of sales	3	2%	2	2%	5	2%
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%		-0.01%		-0.03%	
Median	0.00%**		0.00%		0.00%	
Minimum	-1.9%		-1.14%		-1.9%	
Maximum	0.41%		0.01%		0.41%	

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

** the value 0.00% denotes impacts that are 0.005% and below

Table 20. Summary Results for Small Business Analysis for Halogenated Solvents Residual Risk – Regulatory Option Scenario 3 (40,000 kg/yr MC)*

	Small		**Large**		**All Companies****	
Total Number of Companies in Analysis	179		98		281	
Estimated Annual Compliance Cost Savings (2004$)	-$1,055,557		-$1,648,782		-$2,704,339	
	Number	Share	Number	Share	Number	Share
Companies in Analysis	179	100%	98	100%	277	100%
Compliance costs are 0% of sales or negative	173	97%	95	97%	268	97%
Compliance costs are > 0 to 1% of sales	6	3%	3	3%	9	3%
Compliance costs are > 1 to 3% of sales	0	0%	0	0%	0	1%
Compliance costs are > 3% of sales	0	0%	0	0%	0	0%
Compliance Cost-to-Sales Ratios						
Average	0.03%		0.01%		0.02%	
Median	0.02%		0.01%		0.01%	
Minimum	-0.28%		0.01%		-0.28%	
Maximum	0.41%		0.02%		0.41%	

* This is Option 2 of the two proposed options.

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

Table 21. Summary Results for Small Business Analysis for Halogenated Solvents Residual Risk - Regulatory Option Scenario 4 (25,000 kg/yr MC)*

	Small		Large		All Companies**	
Total Number of Companies in Analysis	186		95		281	
Estimated Annual Compliance Cost Savings (2004$)	-$846,538		-$1,459,953		-$2,306,491	
	Number	Share	Number	Share	Number	Share
Companies in Analysis	186	100%	95	100%	281	100%
Compliance costs are 0% of sales or negative	154	82%	89	94%	243	86%
Compliance costs are > 0 to 1% of sales	29	16%	6	6%	35	13%
Compliance costs are > 1 to 3% of sales	2	1%	0	0%	2	1%
Compliance costs are > 3% of sales	1	0%	0	0%	1	0%
Compliance Cost-to-Sales Ratios						
Average	0.05%		-0.01%		0.01%	
Median	0.03%		0.01%		0.01%	
Minimum	-1.33%		-0.01%		-1.33%	
Maximum	7.81%		0.01%		7.81%	

* This is Option 1 of the two proposed options.

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

Table 22. Summary Results for Small Business Analysis for Halogenated Solvents Residual Risk - Regulatory Option Scenario 5 (15,000 kg/yr MC)

	Small		Large		All Companies*	
Total Number of Companies in Analysis	181		99		280	
Estimated Annual Compliance Costs (2004$)	$11,306		-$1,188,815		-$1,177,509	
	Number	Share	Number	Share	Number	Share
Companies in Analysis	181	100%	99	100%	280	100%
Compliance costs are 0% of sales or negative	137	76%	93	94%	230	82%
Compliance costs are > 0 to 1% of sales	38	21%	6	6%	44	15%
Compliance costs are > 1 to 3% of sales	5	2%	0	0%	5	2%
Compliance costs are > 3% of sales	1	1%	0	0%	1	1%
Compliance Cost-to-Sales Ratios						
Average	0.06%		0.00%		0.02%	
Median	0.04%		-0.01%		0.01%	
Minimum	-1.9%		-1.14%		-1.9%	
Maximum	7.81%		0.04%		7.81%	

Table 23. Summary Results for Small Business Analysis for Halogenated Solvents Residual Risk - Regulatory Option Scenario 6 (6,000 kg/yr MC)

	Small		Large		All Companies*	
Total Number of Companies in Analysis	181		98		279	
Estimated Annual Compliance Cost Savings (2004$)	$1,659,484		-$229,215		$1,430,269	
	Number	Share	Number	Share	Number	Share
Companies in Analysis	181	100%	98	100%	279	100%
Compliance costs are 0% of sales or negative	57	31%	76	78%	133	48%
Compliance costs are > 0 to 1% of sales	104	57%	22	22%	126	45%
Compliance costs are > 1 to 3% of sales	12	7%	0	9%	12	4%
Compliance costs are > 3% of sales	8	5%	0	0%	8	3%
Compliance Cost-to-Sales Ratios						
Average	0.5%		0%		0%	
Median	0.05%		0%		0%	
Minimum	-1.9%		-1.14%		-1.9%	
Maximum	15%		0.41%		15%	

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

Table 24. Summary of Economic Impacts

Regulatory Option	Number of Businesses Affected	Number of Small Businesses Affected	Impacts at 3% or Greater CSR – Small Businesses	Impacts at 1% or Greater CSR – Small Businesses	Small Businesses with Annualized Costs of Less Than 0.01 Percent or Having Cost Savings
Option 1 -100,000 Kg/yr MC equivalent	281	186	0	0	182
Option 2 - 60,000 Kg/yr MC equivalent	279	181	0	0	178
Option 3* – 40,000 Kg/yr MC equivalent	277	179	0	0	173
Option 4** – 25,000 Kg/yr MC equivalent	281	186	1	2	154
Option 5 – 15,000 Kg/yr MC equivalent	280	181	1	6	137
Option 6 – 6,000 Kg/yr MC equivalent	279	181	8	20	57

*Option 1 of the two proposed options

**Option 2 of the two proposed options

Small Business Impact Results

After considering the economic impact of today's proposed action on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. For these co-proposed options, there are 3 small firms out of 181 affected that have annualized compliance costs of 1 percent of sales or higher, and 1 small firm with annualized compliance costs of 3 percent or higher. In addition, a large number of small firms under these co-proposed options will experience annualized cost savings associated with applying the controls to meet the emissions limits included in these options. Based on this information on small business impacts, we make this certification.

While we do not believe these options will lead to significant economic impacts on a substantial number of small entities, we have undertaken efforts to mitigate small entity impacts as part of this rulemaking. We continue to be interested in the potential impact of the proposed action on small entities and welcome comments on issues related to such impact.

References

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