SOLVENTS

Cleaning, Degreasing, Recycling, and Disposing

Compliance Assistance Program
California Environmental Protection Agency
Air Resources Board

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101 WHAT THIS MANUAL IS ABOUT

This technical manual addresses the control and reduction of the air pollutant emissions from solvents. It is a *new* manual, a complete rewrite, to update and *replace* the July 1989 Compliance Assistance Program (CAP) technical manual, "Solvent Cleaning Degreasing Operations." The scope of this new manual includes **degreasing and other solvent cleaning, recycling,** and **disposing** of solvents, plus an overview of replacement solvents.

Contain, Capture, Control

The main purpose of this manual is to promote cleaner air -- by assisting local air pollution control district inspectors and industry operators to conduct complete, systematic, and efficient compliance inspections of solvent operations. If facility operators and inspectors know how to comply with administrative requirements and how to properly contain, capture, control, and minimize pollutants, then they can avoid violations, fines, and costly shutdowns. The manual is designed to *supplement*, but not to replace, operating manuals and training courses provided by manufacturers.

What's in it For You ?

In this chapter you can find a brief overview of the solvents addressed in this manual, followed by introductions to the Air Resources Board, the Compliance Assistance Program, air pollutants, and health effects.

Then, in subsequent chapters, we present:

- Descriptions of the solvent category, including traditional agents and solvent substitutes developed by modern technology,
- Descriptions of solvent processes: degreasing, recycling, disposing, and controls for preventing and limiting the air pollutant emissions,
- Regulation requirements for air pollution control, and
- Checklists/inspection aids and supporting material to help you comply.

What, Why, & How to Comply

Using this manual, you can learn about:

- **Air pollution problems** and health risks from solvents,
- **Alternative solvents** - economy, effectiveness, and low emissions,
- **How to achieve the rewards** of complying with regulations and avoid violations and their consequences.

100 INTRODUCTION

102 WHAT ARE SOLVENTS?

Solvents are liquids used for cleaning and removing foreign materials from metallic and non-metallic surfaces. Traditional solvents have been composed of derivatives of petroleum, including distillates, chlorinated hydrocarbons, chlorofluorocarbons, ketones and alcohols. However, **alternatives for cleaner air quality are available now, and more are being developed**.

102.1 HOW CAN SOLVENTS AFFECT THE AIR QUALITY?

Solvents Are Volatile

Traditional solvents tend to be volatile -- they can readily evaporate into the air. Solvents are particularly vulnerable to evaporation and dispersion when they are:

- Transferred from one place to another,
- Mechanically agitated or sprayed, as in a parts cleaning machine,
- Heated for cleaning operations, and / or
- Exposed to the ambient air, such as when spilled, leaked, or left in uncovered containers.

In California, emissions from solvents include 980 tons of organic gases per day, further classified in the next chapter of this manual. Here is an overview of some of the government agencies that regulate air emissions:

103 CALIFORNIA AIR RESOURCES BOARD

We have a *serious* air pollution problem in California. We are pumping many tons of polluting material into California air every day from the activities of 30 million residents, 23 million cars, and a myriad of industrial sources large and small. Unfortunately, the air pollution is not carried away by fresh sea breezes from the Pacific Ocean. To the contrary, this air pollution tends to remain in place, due to the dominant atmospheric high pressure area, the atmospheric temperature inversions, the terrain barriers and basins, and other factors.

On the other hand, California leads the nation in programs to clean up the air. In 1955 the Bureau of Air Sanitation began identifying the air pollution levels that could endanger public health. Recognizing cars and trucks as a major cause of smog, the State formed the Motor Vehicle Pollution Control Board (MVPCB) in 1960 to regulate tailpipe emissions. California was the first state to adopt vehicle emission standards for hydrocarbons (HC) and carbon monoxide (CO).

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ARB Created

In 1967 the MVPCB and the Bureau of Air Sanitation were combined to create the **Air Resources Board (ARB)**. With this merger, the authority to define the health threat of air pollution and to regulate its causes was united into a single organization. Since then the ARB, working with county and regional air pollution control districts (APCDs), has created one of the world's most comprehensive air quality cleanup programs.

Next came the California EPA. In July 1991 the California Environmental Protection Agency was formed to bring together, under a single accountable cabinet level agency, these entities: the Department of Pesticide Regulation (DPR), the Department of Toxic Substances Control (DTSC), the Office of Environmental Health Hazard Assessment (OEHHA), the Integrated Waste Management Board (IWMB), the State Water Resources Control Board (DWR), nine Regional Water Quality Control Boards, and the ARB.

ARB's Mission Statement

The ARB's mission is:

> "To promote and protect public health, welfare, and ecological resources through effective reduction of air pollutants while recognizing and considering effects on the economy."

What Does the ARB Do ?

So, what does the Air Resources Board do? As the primary statutory authority, the ARB establishes and enforces standards to limit pollutant emissions from motor vehicles. The ARB does more:

1. Conducts inspections, in cooperation with the APCDs, to ensure compliance with air pollution regulations by applying **consistent and evenhanded enforcement.**
2. Develops suggested rules and regulations to assist local APCDs in their efforts to improve the air quality.
3. Establishes air quality standards to protect the health of vulnerable people and to prevent damage to property and crops.
4. Evaluates the effectiveness of pollutant control strategies and programs for vehicles and industry.
5. Monitors air quality throughout the State.
6. Conducts extensive research programs.

100 INTRODUCTION

The ARB's past efforts and the cooperation of industry and the public have reduced the pollution emitted from vehicles and large sources. Now and for the future, the ARB aims to continue to enforce present regulations and to further reduce the effects of *additional* pollution sources. Continuing to clean up our air requires difficult choices, careful planning, and the support of *all* Californians.

104 COMPLIANCE ASSISTANCE PROGRAM

ARB Creates Awareness

Within the Compliance Division, the California ARB has a Compliance Assistance Program (CAP). The CAP produces **innovative publications** to provide assistance to industry and regulators for comprehensive, consistent, and accurate compliance inspections. The goal of the CAP is to reduce air pollution by promoting a greater awareness of air quality regulations and by encouraging cooperation between regulators and industry. Toward this goal, the CAP provides industry with information, checklists, and other self-auditing tools to help them know how to stay in compliance.

Enforcement audits of some industrial sources have shown noncompliance rates as high as 50 percent. Reducing these rates can bring rewards to everyone.

If We Understand We Will Comply

Based on the idea that emission source operators will comply if they understand what is required of them, the CAP identifies requirements of regulations and presents them in several alternative formats. These CAP publications can assist industries to monitor their operations and to conduct their own daily inspections, thus increasing their compliance rates and reducing costly violations.

Through the development and distribution of these rule-specific publications, CAP creates a flow of information in a variety of useful forms:

Handbooks. Easy-to-read, colorfully illustrated handbooks are developed for the industrial labor force on the production line. Most **can be read in 20 minutes**, and all contain helpful self-inspection checklists.

What, Why, & How to Comply

Pamphlets. Quick-reference pamphlets contain detailed flow charts, checklists, and diagrams to assist facility supervisors and inspectors.

Technical Manuals. Detailed technical inspection manuals are developed mainly for industry's environmental managers, ARB inspectors, and local air pollution control district inspectors. These contain rule information, process description, and step-by-step procedures for compliance inspections.

104.1 FOCUS / TARGET AUDIENCE FOR THIS MANUAL

The primary focus of the Compliance Assistance Program is to help inspectors and industrial operators to improve their knowledge of air emissions regulations. In order to reduce noncompliance and excess emissions, both the inspector and the operator need to know what is regulated, why it is regulated, and how compliance is determined.

Who Will Use this Manual ?

This technical manual is targeted for corporate and industrial managers of solvent operations and their staffs, including environmental managers, and for air pollution control district inspectors.

104.2 MANUAL DESIGN

This manual is designed to assist you, the inspectors in government and in industry, in assuring that solvent operations meet the requirements of air pollution control regulations.

This manual provides both an overview and detailed information, along with references for further details. It is divided into easy-to-use, numbered sections and subsections for your convenience.

What is in Each Section ?

Section 100 provides **overviews** of air pollution problems in California, the formation of the ARB and the Compliance Assistance Program, and the design and purpose of this manual.

Section 200, Category Description, includes an overview of common solvents and a description of some of their many applications.

Section 300, Process and Control, describes the various processes used in solvent operations and how emissions can be controlled to protect the air quality.

Section 400 describes **Inspection Procedures** for assuring compliance. This section includes **checklists,** other inspection aids, and guidelines.

Section 500 presents the **Legal Requirements** of the laws and regulations governing solvent operations.

Section 600 discusses **toxics** and halogenated solvents.

The **Glossary** contains a collection of terms used in the manual and the industry.

Executive Summary in Appdx A

The **Appendices** contain supplemental material. **Appendix A** is an an executive summary of alternative control techniques; **B** contains sample inspection forms and checklists; **C** contains sample rules and a Permit to Operate extracted from APCD files; **D** contains an overview of the Department of Toxic Substance Control (DTSC) and lists toxic air contaminants (TACs); **E** contains an extracted guidance document for the halogenated solvent cleaner NESHAP, a USEPA report; **F** contains the NESHAP rule presented by the Federal Register; **G** contains an air toxics fact sheet for the magnetic tape industry; **H** contains descriptions of common and alternative solvents; and Appendix **I** is a place for **your district rules.**

The **Index** at the end of the manual can help you to find topics.

104.3 MANUAL MAINTENANCE

A Dynamic, Living Document

This manual is a dynamic document that relies on your experience and expertise for its changes and improvements. Please read the manual to familiarize yourself with its contents, how it is organized, and how to use it. As you do, please jot down any questions you may have, and highlight anything that is unclear to you. The amendment process starts with you; please use the procedure included here to share your observations and suggestions.

As you identify issues that you think will benefit others, talk with your supervisor and express your concerns. If you want further clarification of a point, call the ARB, Compliance Division, Compliance Assistance Section and leave a message at 1-800-952-5588. If you want additional copies or a listing of other publications CAP produces, call (916) 327-7211. When you believe that the manual should be amended, send your proposed amendment to:

Air Resources Board
Compliance Division, Compliance Assistance Section
P. O. Box 2815
Sacramento, CA 95812

Updates and Tracking Cards

When we receive your proposed amendment, we will review it, contact others to see how widespread the issue is, and respond back to you. For proposed amendments that need immediate response, we will provide draft changes for comment or a workshop may be scheduled. For less critical revisions, we may wait until we have several before having a workshop or comment period and making the appropriate changes.

Right now, when you first receive this manual, please be sure to fill in the tracking card located near the front page, and promptly mail it to the ARB. Then, each time there is a change for your manual we can mail it to you.

105 CALIFORNIA CLEAN AIR ACT

People Want Healthful Air

To protect human health, State and Federal standards were established for ozone and PM10 concentrations in the air, as depicted in Table 100.1. The state *hourly* ozone standard is 0.09 parts per million (ppm) and the federal hourly ozone standard is 0.12 ppm. For a *24 hour period,* the State PM10 standard is 50 micrograms per cubic meter (ug/m^3) and the Federal PM10 standard is 150 ug/m^3.

Solvents Emit VOC

The California State Legislature, aware of California's serious air pollution problems and aware that many geographical areas had not met the State and Federal ambient air quality standards, passed the California Clean Air Act of 1988 (CCAA). For districts designated as non-attainment for the State's ozone standard, the CCAA requires local air pollution control districts to develop control measures to achieve a five percent annual emission reduction of volatile organic compounds (VOC). **(Solvents emit VOC, which can form ozone.)**

Standards: Ozone and PM10

Ambient Air Quality Standards For Ozone And PM10			
Pollutant	**Averaging Time**	**State Std.**	**Federal Std.**
Ozone	1 hour	0.09 ppm (180 ug/m^3)	0.12 ppm (235 ug/m^3)
PM10	Annual Geometric Mean	30 ug/m^3	- - -
	24 hours	50 ug/m^3	150 ug/m^3
	Annual Arithmetic Mean	- - -	50 ug/m^3

Table 100.1 Ambient Air Quality Standards

Most Californians live in areas which have not attained the State standards for ozone or PM10.

106 AIR POLLUTION HEALTH CONCERNS

Health Concerns

Air pollution degrades the quality of life for millions of Californians every day. In southern parts of the state, sixteen million residents are regularly exposed to levels of air pollution that can cause nausea, headaches, eye irritation and dizziness, even in healthy adults.

Some People Are More Sensitive

While air pollution affects everyone to some degree, some people are particularly sensitive to its effects: small children, the elderly, and people who suffer from disease of the heart or lungs. An estimated one person of every five in California, or about 6 million people, may be especially susceptible to health problems caused by air pollution. The standards for air quality, which are based on research to determine the concentrations at which pollutants can be harmful, also include a margin of safety to protect these more vulnerable people. (See Table 100.1)

Common Air Pollutants

A discussion of toxic air contaminants (TACs) is deferred to Chapter six, but these next subsections discuss health problems associated with the more *common* air pollutants:

- **Ozone** (O_3),
- **Sulfur oxides** (SOx),
- **Carbon monoxide** (CO), and
- **Volatile organic compound** (VOC)
- **Particulate matter** (PM),
- **Nitrogen oxides** (NOx).

106.1 OZONE

Carbon Compounds Lead to Ozone

Ozone, a colorless gas and the chief component of smog, is one of California's most persistent and widespread air quality problems. Ozone is formed from VOCs and nitrogen oxides emitted from motor vehicles and industrial sources, in chemical reactions in the presence of sunlight.

Ozone is a strong irritant that can cause constriction of the airways, forcing the respiratory system to work harder in order to provide oxygen. Short term exposure over an hour or two can cause shortness of breath, and it can aggravate respiratory diseases such as emphysema, bronchitis, asthma, and heart ailments. Even after coughing, sore throat, or other symptoms disappear, *chronic* exposure to ozone can permanently damage the membranous, filmy tissues of the air sacs, or alveoli, deep in the lungs, where oxygen and carbon dioxide are exchanged. Ozone thus threatens the health of our most vulnerable people, including children and the elderly.

Ozone, or smog, can also damage crops and vegetation. It can stunt growth, reduce yield, damage leaves, and reduce market value. Even low level ozone exposure, over long time periods, can reduce plant growth and fruit yield and increase crop susceptibility to disease and insect attack.

106.2 VOLATILE ORGANIC COMPOUND (VOC)

Volatile organic compounds (VOCs) contain at least one atom of carbon. Exclusions from this classification are methane, carbon dioxide, and certain other organic compounds determined by the U. S. Environmental Protection Agency (USEPA) and the ARB to be non-photochemically reactive. VOCs are used as solvents for many cleaning applications and as propellants in consumer products. Some VOCs are emitted each time someone uses hair spray or carburetor cleaner, writes with a felt tip pen, or waxes a car.

106.3 NITROGEN OXIDES

NOX

Nitrogen dioxide (NOX) is a by-product of all combustion and is emitted from sources such as motor vehicles, industrial boilers, and heaters. It is one of the pollutants known generically as nitrogen oxides, which are a major component of urban smog (ozone), and it gives a reddish brown color to haze. Nitrogen dioxide concentrations remain high even in winter months, when the photochemistry that forms ozone is weak.

NOX and SOX Can Impair Breathing

Breathing high levels of nitrogen dioxide causes irritation to the respiratory tract and causes shortness of breath. In comparison to healthy adults and children, individuals with asthma or other respiratory illness may be more susceptible to the effects of nitrogen dioxide.

Some studies have shown that when children are exposed to moderate levels of nitrogen dioxide, they may have more colds and flu. For people with respiratory illness, inhaling low levels of nitrogen dioxide *while exercising* can narrow their airways, further increasing their breathing difficulties.

106.4 SULFUR DIOXIDE

SOX

Sulfur oxides (SOX) are produced primarily by the combustion of coal, fuel oil and diesel fuel. They can be a source of odor problems near refineries. Sulfur oxides at low levels of exposure can cause eye, nose, and respiratory tract irritation. At high exposure levels, the lung airways narrow, causing wheezing, chest tightness, or other breathing problems.

People with respiratory illness such as asthma are particularly susceptible to the effects of sulfur oxides, so they may have adverse symptoms at lower levels of exposure than for other people. The air quality standard was set to protect them from breathing difficulties during and after brief exercise.

Children exposed to sulfur oxides experience increased respiratory tract infections and healthy people may experience sore throats, coughing and breathing difficulties when exposed to high concentrations of sulfur oxides.

106.5 PARTICULATE MATTER

Particulate matter is composed of solid or liquid particles from vegetation, the soil, combustion, or other industrial processes. It can be emitted directly into the air. For example, vehicles on roadways constantly toss up dust with their tires. Farming operations such as plowing and cultivating disturb the soil surface and produce new material for wind erosion. Particulate matter can also be generated through photochemical reactions among polluting gases, primarily nitrogen oxides and sulfides.

All particulates are a potential threat to human health, but the greatest concern are those with a diameter of 10 microns or less (PM10). These particles, about 1/5 the thickness of a human hair, are small enough to penetrate deeply into the lungs. There they may remain, causing irritation to the respiratory tract. Furthermore, as these particles enter the lungs, they may also bring toxics attached to their surfaces. The toxic compounds in some of the directly emitted combustion particulates, such as diesel soot and wood smoke, can include benzene and dioxin.

PM10 Particles Clog Lungs

Short term exposure to particulate matter can lead to coughing and minor throat irritation, respiratory illness, and lung damage and death for sensitive individuals. Longer term exposures can cause increased risk of bronchial disease, cancer, and premature death.

106.6 CARBON MONOXIDE (CO)

Carbon monoxide (CO) is a by-product of incomplete combustion, primarily from motor vehicle exhaust. The highest concentrations are found in areas with congested or high volumes of traffic, especially during winter months. (With less solar heating in winter, the ground is cooler, leading to a more *stable* atmosphere. Hence, the pollutants tend to sink and accumulate.)

Ironically, people often petition for additional neighborhood stop signs for pedestrian safety, little realizing that slower traffic may produce additional air pollution for that same neighborhood: *vehicles remain there longer* as they line up at the stop signs, and then *they accelerate* after stopping.

Carbon monoxide can be absorbed into the body from the lungs, where it readily binds with the hemoglobin in the blood, reducing the ability of this protein to carry oxygen. As a result, insufficient oxygen reaches the heart, brain and other tissues, which can be crucial for people with heart disease or anemia, as well as unborn children. Even healthy people who are exposed to carbon monoxide can experience headaches, fatigue, slow reflexes, and dizziness, sleepiness, nausea, vomiting, confusion, and disorientation.

Carbon Monoxide's Effects are Insidious

At very high concentrations CO can cause loss of consciousness, leaving the victim unable to escape death. Since the gas is odorless and causes symptoms similar to other illnesses, sometimes an entire family may not recognize that carbon monoxide is poisoning them. Carbon monoxide's deadly effects may go unrecognized until it is too late.

(A discussion of toxic air contaminants (TACs) has been deferred to a place of its own: Chapter 6.)

200 CATEGORY DESCRIPTION

What's in This Chapter & What's Not

This chapter lists and describes typical solvents, both traditional and more recent formulations, including their main ingredients, properties, and toxic aspects. Toxics are discussed in more detail in Chapter six, which is devoted to that subject. Solvent ***equipment*** descriptions are deferred to Chapter three, Process and Control. For paints and thinners, other CAP manuals are available: Aerospace Coating Operations, Automotive Refinishing, and Metal Parts and Products.

201 SOLVENTS: AN OVERVIEW

Regulated Solvents Contain VOCs

What are solvents? In general terms, solvents are agents which dissolve, thin, or "melt" another substance. The main focus of this manual is on the ***regulated* solvents**, which contain volatile organic compounds (**VOCs**). However, we will also briefly discuss some of the many alternatives which modern technology has developed. Substitutes such as water based citric formulations may offer you advantages, as you will see in Section 202. First, let's look at traditional solvents.

201.1 TRADITIONAL SOLVENTS

Many of the solvents which industry has used effectively for years are derived from petroleum. Organic solvents such as these can be used alone or in blends to remove soils or to prepare parts for painting, plating, repair, inspection, assembly, heat treatment, or machining. Dozens of organic solvents are available to dissolve and remove oils, greases, waxes, tars, or even water. These products can flush away insoluble matter, such as sand, metal chips, buffing abrasives, or fibers held by the soils. In general, these traditional solvents have cleaned very well. Here are some of the most common solvents:

Common Solvents

Alcohols
Aliphatic Hydrocarbons
Aromatic Hydrocarbons
Chlorinated Solvents
Fluorinated Solvents
Ketones

Which solvent will you choose? Your choice may be based on its solubility for a type of soil, or for its toxicity, flammability, evaporation rate, effect on non-metallic portions of the part to be cleaned, and numerous other properties.

Table 200.1 on the next page summarizes characteristics of common generic solvent chemicals. Appendix H replicates this table along with related information and explanations in more detail.

Table 200.1 Characteristics of Generic Chemical Classes

Classes	Examples*	Flash Point	Volatile	VOC	Ozone Depletion	Global Warming	Cleaning
Flammable Solvents	IPA, Acetone	Yes	Yes	Yes	No	No	Good
Combustible Solvents	Terpenes, DBE, NMP	Yes	No	Yes	No	No	Good
Chlorinated Solvents	CT,TCE, PERC,TCA	No	Yes	Some	Some	Some	Good
CFCs	CFC-11,CFC-113	No	Yes	No	Yes	Yes	Modest
HCFCs	HCFC-123, HCFC-141b,HCFC-225	No	Yes	No	Yes	Yes	Good
HFCs	HFC-43-10	No	Yes	No	No	Yes	Poor
FCs or PFCs	--	No	Yes	No	No	Yes	None
BHCs	Methylene bromide	No	Yes	No	Yes	Yes	Good
FICs	Fluoroiodomethane	No	Yes	NA	NA	NA	NA

NA is not available.
*See text [Appendix H] for full names of abbreviated names and further explanations.

"We Already Tried Water."

Why not use water? Before *solvent* methods are chosen for cleaning, water or detergent solutions are usually tried first. Why? Water is readily available, cheap, safe, nontoxic, and its characteristics are well-known. However, water has several limitations. For example, since it has a high surface tension, water does not penetrate fine crevices or tiny holes. Furthermore,

Will Water Work ?

- Water will not dissolve some organic soils,
- Water dries slowly,
- Water can conduct electricity, and
- Water rusts ferrous metals and stains non-ferrous metals.

Organic solvents can overcome all these disadvantages. Unfortunately, though, most solvents bring along intrinsic problems of their own, including air emissions and toxicity levels.

Solvent Problems: Traditional solvents not only clean well, but they also *dry quickly*. That, ironically, is one of the main problems. They're *volatile*: they readily vaporize, escaping into the air. The elements which escape from solvents include VOCs, which form harmful ozone in our lower atmosphere. The effects of ozone were discussed in the first chapter of this manual.

Montreal Protocol

Some of the other elements which escape from solvents may deplete the ozone layer in our *upper* atmosphere -- the ozone layer which protects us from the ultraviolet rays of the sun. In order to reduce the depletion of the protective ozone layer, an international group of scientists and environmental leaders produced an agreement called the Montreal Protocol, ending the use of one main traditional solvent by the year 2002: 1,1,1-trichloroethane (**TCA**).

A Serious Debate

Should we phase out most regulated solvents in favor of "cleaner" unregulated cleaners? One burning question is whether or not properly managed and regulated traditional solvents would pollute the environment *less* than rampantly misused unregulated "cleaner" solvents. A serious debate of this issue could help industry and enforcement agencies determine and plan for an efficient evolution of cleaning substances and strategies.

201.2 SOLVENT APPLICATIONS

Who Uses Solvents ?

Who uses solvents? As you might expect, **metalworking** industries use solvents the most, but many other industries frequently use them too: furniture, jewelry, plumbing, refrigeration, business machinery, printing, chemicals, plastics, rubber, glass, paper, electric power, and movies. (See Figure 200.1). Some electronics must be so immaculate that personnel have to wear sterile clothing, as in Figure 200.2. Routine maintenance employs solvents to clean electric motors, cars, trucks, trains, buses, aircraft, and forklifts. **In fact, *most* businesses use solvent cleaners either occasionally or regularly.**

After approximately a thousand prints have been made from the movie film negative, the reels are loaded into these several cleaning cabinets to remove foreign particles and impurities. The negative passes from one reel to and through an ultra sonic bath of solvent at the bottom of the cleaning unit, and then onto the other reel.

In one form of recycling, this movie film negative cleaning operation has a closed system of solvent *vapor recovery* connected to components located on the roof. How it works is described later in this chapter, in section 204 on recycling.

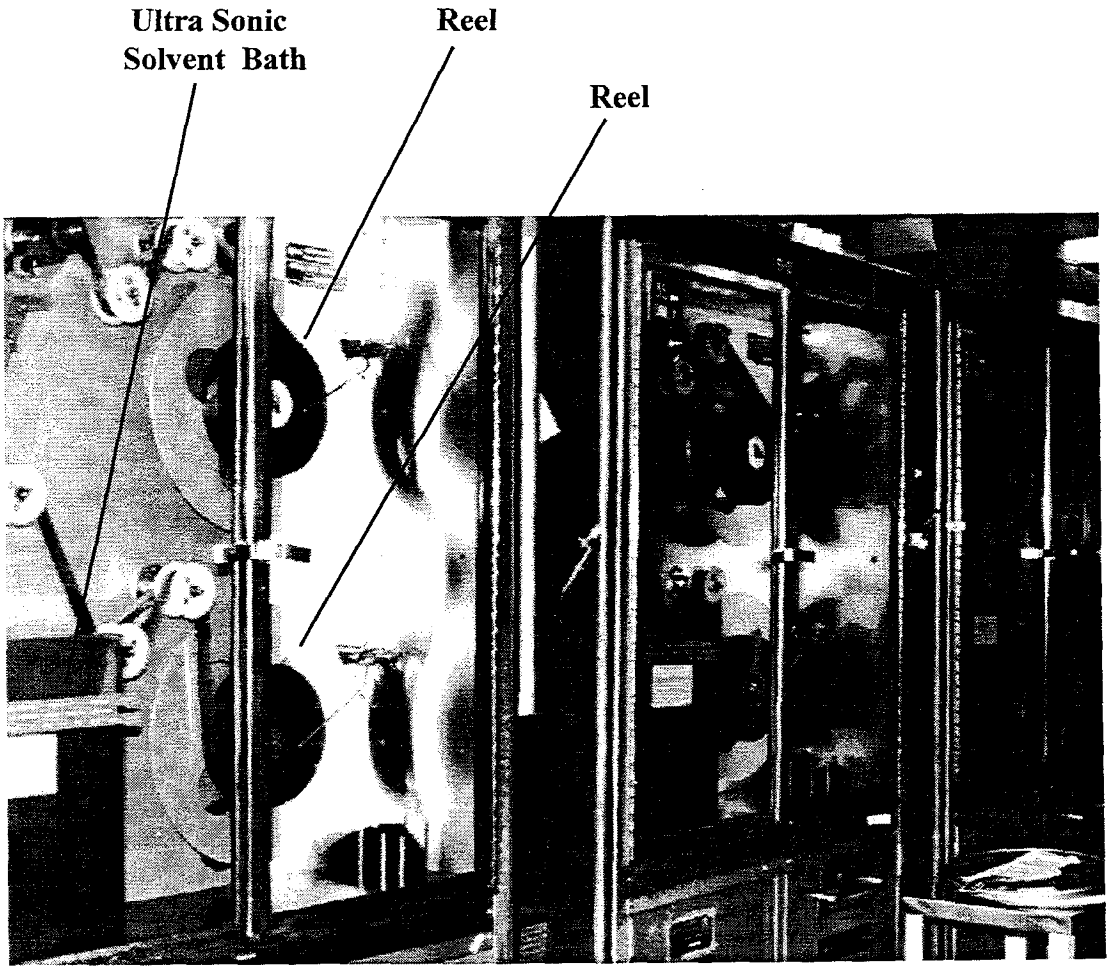


Figure 200.1 Cleaning Movie Film Negatives at Technicolor, Inc.

Some electronics applications, such as relays and switches for satellites in space, must be immaculately clean or sterile. In the facility shown below, personnel don vinyl gowns, head covers, and booties before entering the cleaning room.

Figure 200.2 Some Electronics Cleaning Requires Sterile Clothing.

200 CATEGORY DESCRIPTION

Solvent cleaning, the most common use, refers to those processes using non-aqueous solvents to clean and remove soils from metal and non-metal surfaces. These solvents, which are principally derived from petroleum, include petroleum distillates, chlorinated hydrocarbons, chlorofluorocarbons, ketones and alcohols. Organic solvents such as these can be used alone or in blends to remove soils which are not water soluble and to prepare parts for painting, plating, repair, inspection, assembly, heat treatment, or machining. (Coatings and paint thinners are addressed in other CAP technical manuals.)

Solvent cleaning or *degreasing,* causes over 20,000 tons of VOC emissions per year in California, according to the ARB Emission Inventory. These degreasing operations can be divided into **three major classifications,** which are further described in Section 301:

Solvent Cleaning

1. **Cold cleaning,** the most common,
2. **Open top vapor degreasing,** and
3. **Conveyorized degreasing**.

Cold cleaning processes include spraying, brushing, flushing, and immersion. Occasionally, the solvent in cold cleaners is heated, but never close to its boiling point. Of the three categories of degreasers, cold cleaners emit the most total pollutants because of two factors:

1. The large number of cold cleaning units, and
2. The evaporation from the discarded waste solvent.

Nationally, cold cleaning accounts for almost all of the aliphatic and oxygenated degreasing solvent emissions and about 1/3 of the halogenated degreasing solvent emissions. The average cold cleaning unit generally emits approximately 1/3 ton of organics per year, over half of which comes from evaporation of the waste solvent after it is taken to a disposal site.

A broad spectrum of organic solvents are available. Choices among the solvents are based on their solubility of the soil, toxicity, flammability, evaporation rate, effect on non-metallic portions of the part to be cleaned, and other properties, many of which were summarized in Table 200.1.

Cold cleaning operations use all types of solvents. Open top vapor degreasing operations tend to use halogens (containing chlorine and/or fluorine), because they are not flammable and their vapors are much heavier than air.

202 ALTERNATIVE SOLVENTS

Modern technology has already developed many alternative solvents, including water based citrus formulations. Additional agents are continually being designed, tested, and marketed. Most of these newer agents offer you two main advantages:

- They are more environmentally protective than traditional solvents, and
- They are *largely unregulated* agents, so **you may be able to save money** by avoiding the need for permits, fees, and other expenses.

After extensive tests and studies of *substitutes* for their own solvent applications, Lawrence Livermore National Laboratory (LLNL) staff kindly provided a detailed report on many of these alternatives. LLNL's summary narrative is reprinted here, followed by Table 200.2, summarizing the characteristics of these solvent substitutes.

Next, Figures 200.3 - 200.5 illustrate how a California corporation used alternative solvents to their advantage. **Could *you*, perhaps, also benefit from solvent conversion?**

Could Solvent Conversion Help You, Too ?

(Beginning of LLNL narrative)

Replacement Solvents: A Lawrence Livermore Summary

> "Lawrence Livermore National Laboratory (LLNL) has studied more than 70 alternative cleaners as potential replacements for chlorofluorocarbons (CFCs), halogenated hydrocarbons (e.g., trichloroethylene and trichloroethane), hydrocarbons (e.g., toluene and Stoddard Solvent), and volatile organic compounds (e.g., acetone, alcohols). This report summarizes LLNL's findings after testing more than 45 proprietary formulations on bench-scale testing equipment and in more than 60 actual shops and laboratories. Cleaning applications included electronics fabrication, machine shops, optical lenses and hardware, and general cleaning. Most of the alternative cleaners are safer than the solvents previously used and many are nonhazardous, according to regulatory criteria."

"Reasons to convert cleaning operations to less hazardous solvents include the following: (1) CFCs and trichloroethane are stratospheric ozone-depleting substances (ODSs), whose availability will be drastically limited by the

Montreal Protocol, the Clean Air Act (CAA) of 1990, Executive Order 12843, and Department of Energy (DOE) directives; (2) all DOE facilities must reduce the use of priority chemicals listed by the U.S. Environmental Protection Agency EPA 33/50 program; (3) air permits to use precursor organic compounds (POCs) and volatile organic compounds (VOCs) are expensive and require extensive record keeping; (4) the cost to dispose of spent hazardous solvents often far exceeds the initial cost of fresh solvent; (5) less hazardous alternatives usually present far less risk to worker safety; and (6) these alternatives present less risk of environmental harm and future liability."

Replacement Solvents: A Lawrence Livermore Summary

"Alternative cleaners have been identified that can replace CFCs, 1,1,1-trichloroethane (TCA), or other hazardous solvents in most of the applications tested. It is not possible to select one or two alternatives as the cleaners of choice of all LLNL applications. Different situations require different products."

"Vacuum applications, for instance, often require non-aqueous products because any residual moisture will freeze at low pressures. The alternatives that gave the best cleaning performances in different tests are listed below. The user may also need to consider changing the cleaning procedure as well as the cleaning solvent to employ the alternatives most effectively. For example, test data indicate that ultrasonic cleaners frequently clean better than traditional vapor degreasers. Except for a perfluorocarbon solvent, none of the cleaners that LLNL tested are suitable as drop-in replacements for vapor degreasers. EPA questions the use of perfluorocarbon solvent because of concern about its global warming potential."

"Manufacturers of most of the alternative cleaners recommend rinsing parts with deionized water. Special drying techniques may enable use of water in applications that previously required nonaqueous cleaners. If the use of water cannot be tolerated for a particular application, then a hazardous material such as acetone or a volatile alcohol may have to be used for rinsing."

"Over the last two years, LLNL has tested quantitative performance measures that can be used to compare traditional and alternative solvents in a variety of precision cleaning applications. Two fundamentally different analytical approaches have been examined: destructive and nondestructive tests. Destructive tests require removing residue from the sample after cleaning in order to perform an analysis. Complete removal is often very difficult to achieve. Nondestructive tests can measure residue in situ. Another advantage of nondestructive testing is that the sample can be subjected to subsequent testing."

Replacement Solvents: A Lawrence Livermore Summary

"LLNL performed quantitative cleanliness tests for selected applications by using the following techniques to measure the amount of impurities remaining on the cleaned surface: (1) optical scanning, (2) ionography, (3) x-ray fluorescence, (4) Fourier transform infrared (FTIR) spectrometry, and (5) gas chromatography/mass spectrometry (GG/MS). Other techniques have been used elsewhere to determine surface cleanliness. For example, Los Alamos National Laboratory has used ellipsometry, Oak Ridge National Laboratory used electron spectroscopy chemical analysis (ESCA), and Allied-Signal Kansas City Division used measurement and evaluation of surfaces by evaporating rate analysis (MESERAN). Battelle developed measurement with stable (nonradioactive) isotopes for the Aerospace Guidance and Metrology Center. Section 5.0 discusses these methods in detail and presents the advantages and disadvantages of the various quantitative analytical methods that have been identified."

[**End of LLNL narrative.** This report also contains a brief discussion of some techniques that have been used to examine the materials compatibility and long-term effects of using alternative cleaners.]

Application	Best Performers	Cleaner Type	Potential Hazards
Removing solder flux from printed wiring board	Church & Dwight Co.- Armakleen E-2000	Unidentified	None identified[1]
Removing Molecular Fluid Tapping Compound	Brulin-MP1793 Inland Tech.-EP921 Brulin-1990GD Inland Tech-X-Caliber	Hydrocarbon Terpene Detergent Terpene and NMP	Toxicity untested None identified None identified None identified
Removing copper oxide from copper at room temperature	Inland Tech-Citra Safe	Terpene	Toxicity and flammability
Cleaning copper oxide from copper at 60°C	OCS Manufacturing-OCS H2002E	Glycol ether	Toxicity
Cleaning aluminum	Brulin-815GD	Detergent	None identified
Removing Dow Corning vacuum grease from glass	Goode Chemical Co.-E.C.G. Marine	Unidentified	Toxicity untested
Removing Apiezon vacuum grease from glass	Kyzen Corp.-Metalnox PC1	Unidentified	None identified
Removing Dow Corning vacuum grease from stainless steel	Kyzen Corp.-Metalnox PC1 Brulin-MP1793 U.S. Polychem-J.A.L.S.A.C.	Unidentified Hydrocarbon Borate and silicate	None identified Toxicity untested None
Removing Apiezon vacuum grease from stainless steel	Brulin-MP1793 U.S. Polychem-J.A.L.S.A.C. Brulin-815GD	Hydrocarbon Borate and silicate Detergent	Toxicity untested None identified None identified
General Purpose Cleaning (aqueous)	Brulin-815GD	Detergent	None identified
General Machine Shop Cleaning (aqueous)	Brulin-815GD	Detergent	None identified
General Machine Shop Cleaning (nonaqueous)	Brulin-MP1793	Hydrocarbon	Toxicity untested
Removing Dykem from metals	Inland Tech-EP921 QO Chemicals Inc.-Furfuryl alcohol PURAC-Purasolv ELS Ramco Specialty Products-SSD92 QO Chemicals Inc.-THFA Inland Tech.-X-Caliber	Terpene Alcohol Lactate ester Terpene and glycol ether Alcohol Terpene and NMP	None identified Toxicity untested Toxicity untested Toxicity untested Toxicity untested None identified
Cleaning Epoxy Paint from Silk Screen	Brulin-815GD U.S. Polychemical-J.A.L.,S.A.C. Ramco Specialty Products-NC-300	Detergent Borate and silicate Silicate	None identified None identified None identified
Cleaning graphite lapping compound from steel tools	Inland Tech.-EP921 Brulin-1990GD Inland Tech.-X-Caliber	Terpene Detergent Terpene and NMP	None identified None identified None identified

Table 200.2 Summary Of Alternative Solvent Characteristics (LLNL)

Figures 200.3- 200.5 show alternatives at work: low VOC paints, which allow the use of water-based silkscreen cleaners.

Figure 200.3 Alternatives At Work: Low VOC Inks Used For Silkscreens

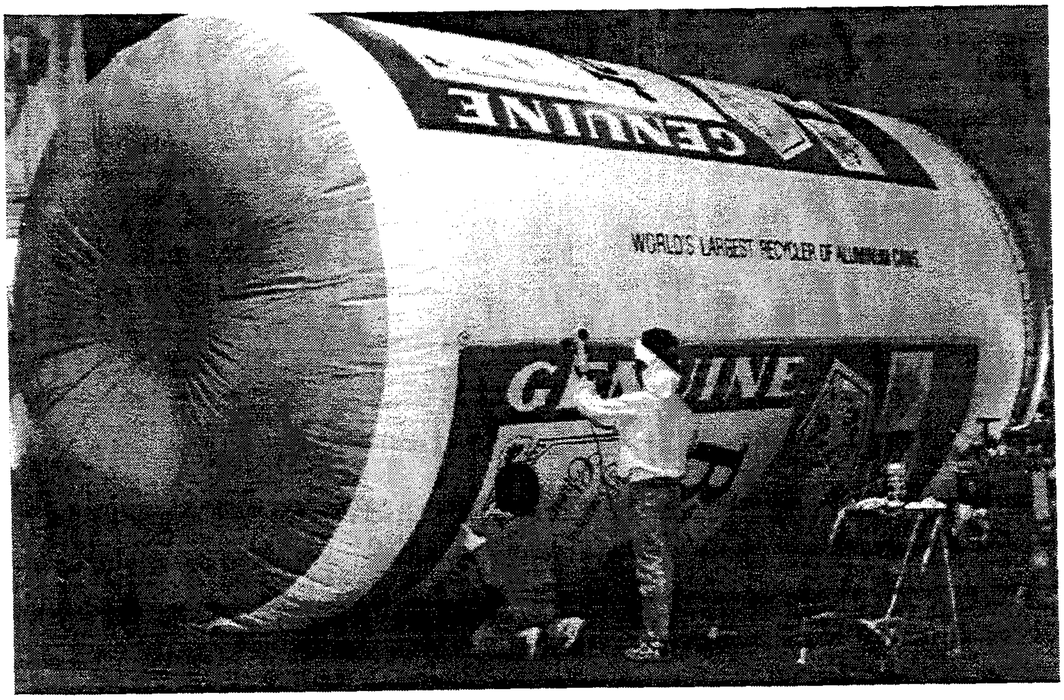


Figure 200.4 Alternatives At Work: Touch-up After Silkscreening

Figures 200.3 - 200.5 show alternatives at work: low VOC inks which allow the use of water-based silkscreen cleaners. Finding acceptable combinations of inks and aqueous cleaners may require experimentation.

Figure 200.5 Final Touch-up After Silkscreening

But Not Anymore

(Caption for Figures 200.3 - 200.5)

The ambient air in BTL's* factory was unpleasant to their employees, and it caused breathing difficulties.

But not anymore.

BTL's process emissions occasionally irritated the workers' eyes. They often wore face masks for an entire shift.

But not anymore. (Greatly reduced, except an isolated instance.)

Absenteeism and dissension among the work force were problems.

But not anymore.

Furthermore, BTL's emissions required that they obtain and comply with source operating permits.

But not anymore.

WHAT HAPPENED?

* Bigger Than Life (BTL) is a California corporation. It manufactures huge vinyl, air-inflated models of industrial products for promotions and advertising, such as a Lion to premiere Disney's The Lion King or a Hunt's catsup bottle. BTL uses bright colors of ink, printed one color at-a-time through dozens of huge silkscreens which must be cleaned after each use.

Most of BTL's air emissions came from their inks and from the solvents they were using to clean the silkscreens. Through research and repeated experiments, BTL found satisfactory inks which contained less VOC. They also found *aqueous* (water-based) solvents which cleaned the screens well with virtually zero emissions.

NOW . . . A supervisor reports that absenteeism is low. Employees are happier and more productive.

And furthermore, **BTL reduced their total emissions below 15 lbs per day, so that their operating permits were no longer required.**

203 STORING SOLVENTS

Stored solvents must be sealed in secure, properly labeled, non-leaking containers, and located in protected areas. Figure 200.6 shows a storage area with a raised concrete lip around the perimeter to contain any inadvertent spills. While usable, solvents are considered working *materials,* but *spent* solvents are usually classified as hazardous wastes, and they may be limited to 90 days of storage. For recycling or disposal, they must be manifested for transport by an authorized carrier. Basically, four criteria determine a hazardous waste: ignitability, corrosivity, reactivity, and toxicity. See Appendix D for further details.

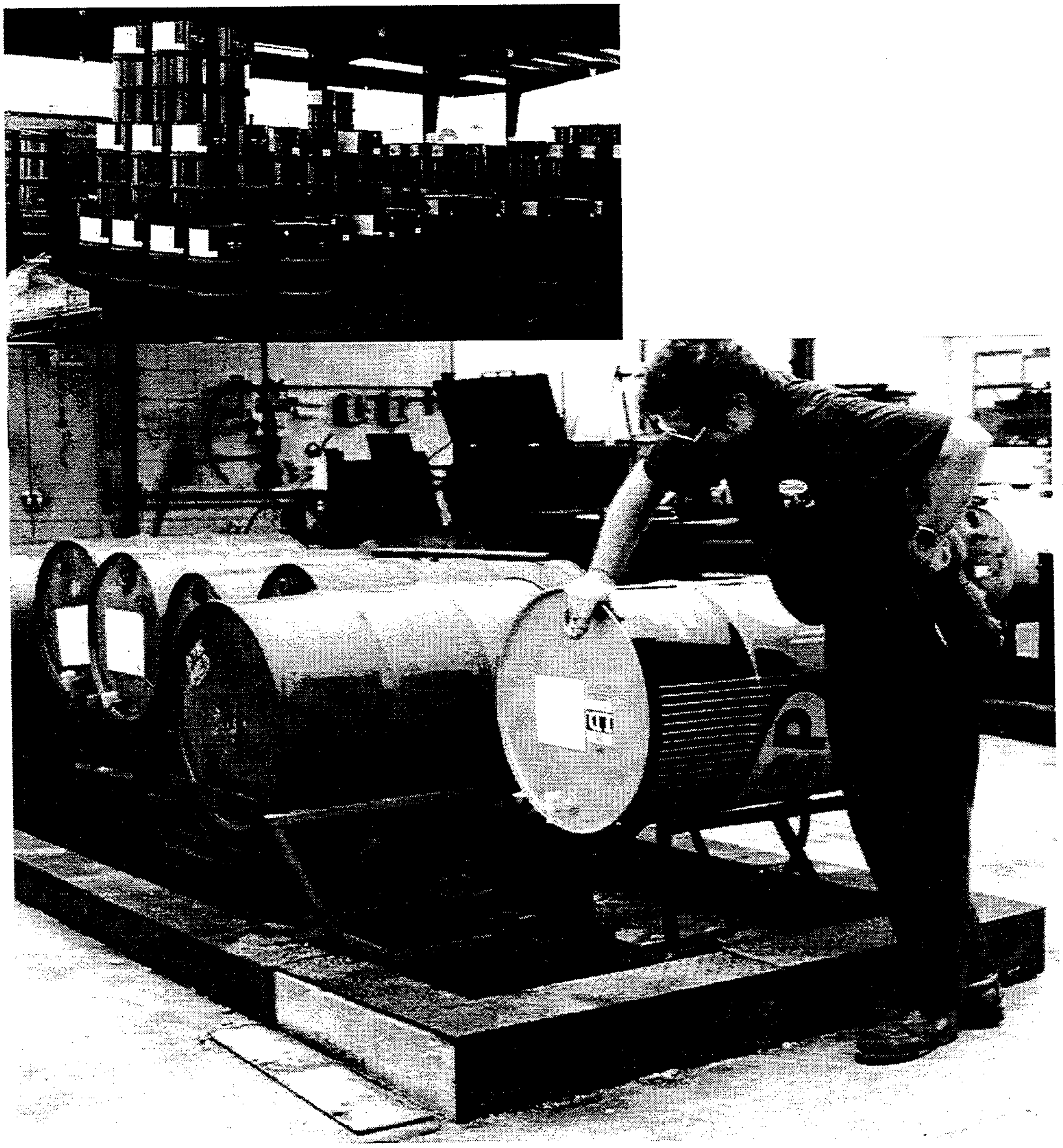


Figure 200.6 Solvents Must Be Labeled

204 RECYCLING SOLVENTS

When a solvent becomes filled with dissolved impurities, it is drained or pumped out of the cleaning unit for filtering, recycling, or disposal. One form of recycling is ***vapor recovery***, as we mentioned previously in this chapter (Figure 200.1). Technicolor, Inc. has an essentially closed, constantly recovering system. The object is to recover and re-use the 1,1,1-Trichloroethane CF2 Film Clean solvent contained in the vapor laden air stream issuing from Lipsner-Smith Ultra Sonic Film Cleaning Cabinets. Three carbon beds similar to those in Figure 200.7 are always recovering while one carbon bed is being cleaned in an automatic, timed cycle. Their recovery efficiency is approximately 80%.

This is how it works: Vapor laden air from inside the cleaning cabinets is combined with air captured from the cleaning room and is ducted to steam heated carbon bed adsorbers. The steam picks up the solvent and is then condensed. The solvent and water are separated by decanting. The water goes to the wastewater stream. The solvent goes through a resin tank to remove moisture, then through calcium carbonate chips to neutralize acid, then through another resin tank to remove trace amounts of moisture. Finally, the solvent goes to a recovery tank, where a corrosion inhibitor is added. The solvent is recovered and ready for re-use.

Figure 200.7 Carbon Bed Adsorbers

Other methods of recycling are often used. When the solvent becomes filled with dissolved impurities, it is drained or pumped out of the cleaning unit for filtering, recycling, or disposal. If it is reusable after only in-house filtering, then a filter may be built into the cleaning unit. Other choices include the use of an innnovative homemade pump like the one in Figure 200.8, which incorporates its own filter. This contraption, a practical product of Yankee ingenuity, pumps the solvent out of a simple degreaser, filters it, and returns it to the same degreaser in a single operation conducted from time to time.

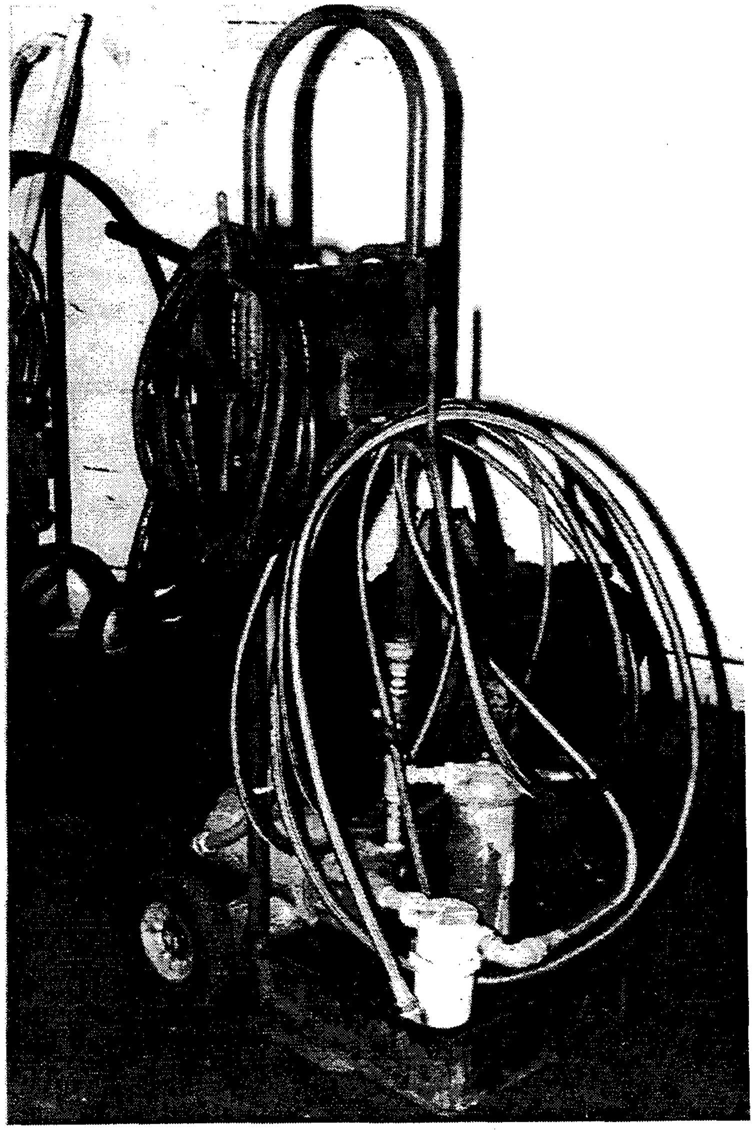


Figure 200.8 Yankee Ingenuity: A Portable Solvent Recycling System

For more complete filtering, or to send spent, used-up solvent to a recycling plant, or to remove it from a cleaning machine for disposal, the Yellow-Bellied Sump-Sucker system shown in Figure 200.9 is often used.

Recycling

At a recycling plant, laboratory technicians test samples of the solvent to determine what elements it contains and whether or not toxic agents are present. The results of the tests dictate the recycling and handling processes to be used. Leftover sludge wastes are used for fuel if they can be burned, but toxic substances must be properly disposed of in other ways.

Figures 200.10 through 200.12 are several views of a recycling plant in the Los Angeles area. Since 1954, this facility's primary operation has been recycling solvents. However, that has changed in the last several years. Air quality regulations have provided the impetus for an industrial shift from traditional solvents to water-based cleaners. As a result, the plant now also blends heavy sludge and non-recyclable waste to be used as supplemental fuel in facilities such as cement kilns.

These wastes arrive at the recycling plant in drums or in bulk, including rail cars. They are unloaded into the drum storage area or into bulk waste storage/treatment tanks. Reusable solvent products are reclaimed by means of settling, physical separation, distillation, thin film evaporation, and dewatering to produce aqueous and sludge waste by-products. The recycled solvents are sold or exchanged for reuse.

Hazardous Waste: Label, Manifest

The semi-solid, solid, and non-recyclable wastes generated in the recycling process may be blended and manifested for transporting offsite for use as supplemental fuels or destructive incineration or disposal by other means. As hazardous waste, solvent sludge materials must be properly labeled, stored in an authorized area for a time which may be limited to 90 days, and then manifested for transportation by an authorized carrier. (See Appendix D.)

200 CATEGORY DESCRIPTION

This device is commonly used in solvent cleaning operations. It is essentially a temporary storage tank on wheels. It incorporates a pump to remove spent solvent from the sumps of cleaning units for recycling or disposal. The bottom of the tank is painted yellow. Hence, it is called a Yellow-Bellied Sump Sucker.

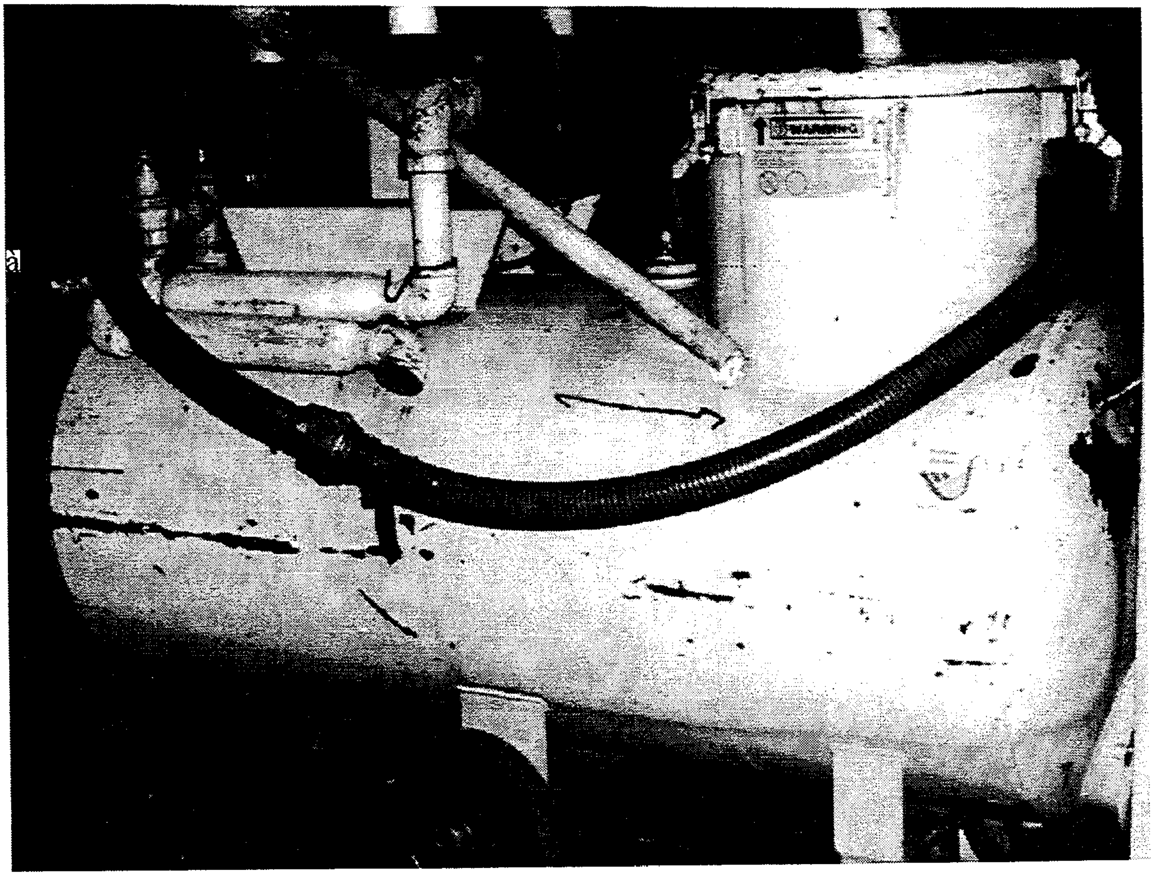


Figure 200.9 A Yellow-Bellied Sump-Sucker

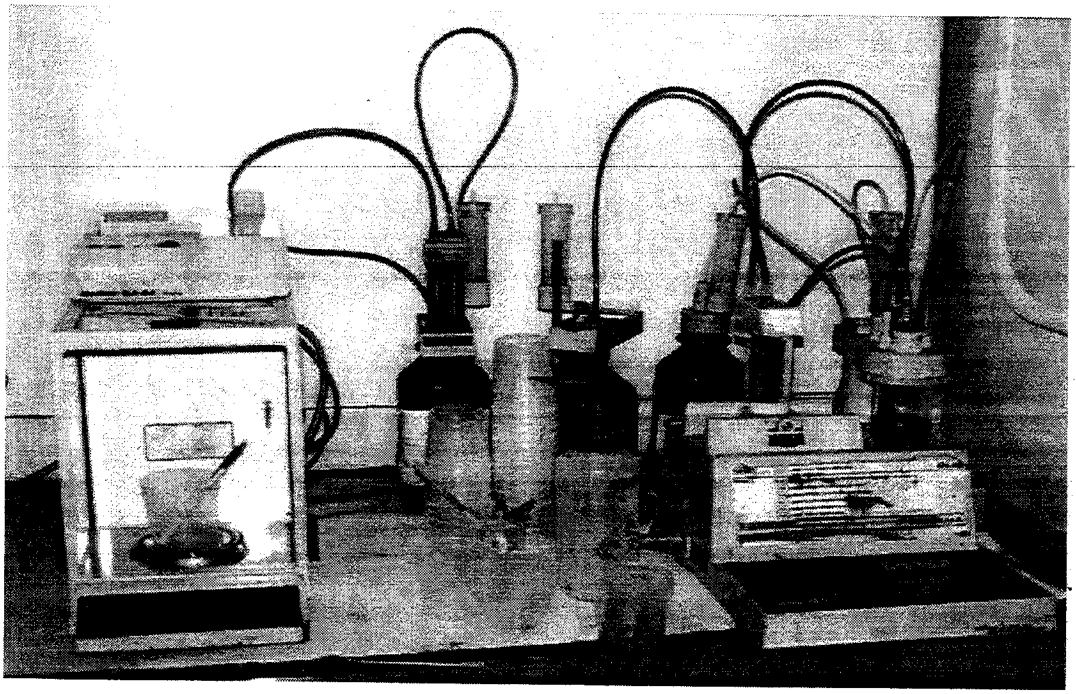


Figure 200.10 Solvent Recycling Laboratory Equipment

Figure 200.11 View One of a Solvent Recycling Plant

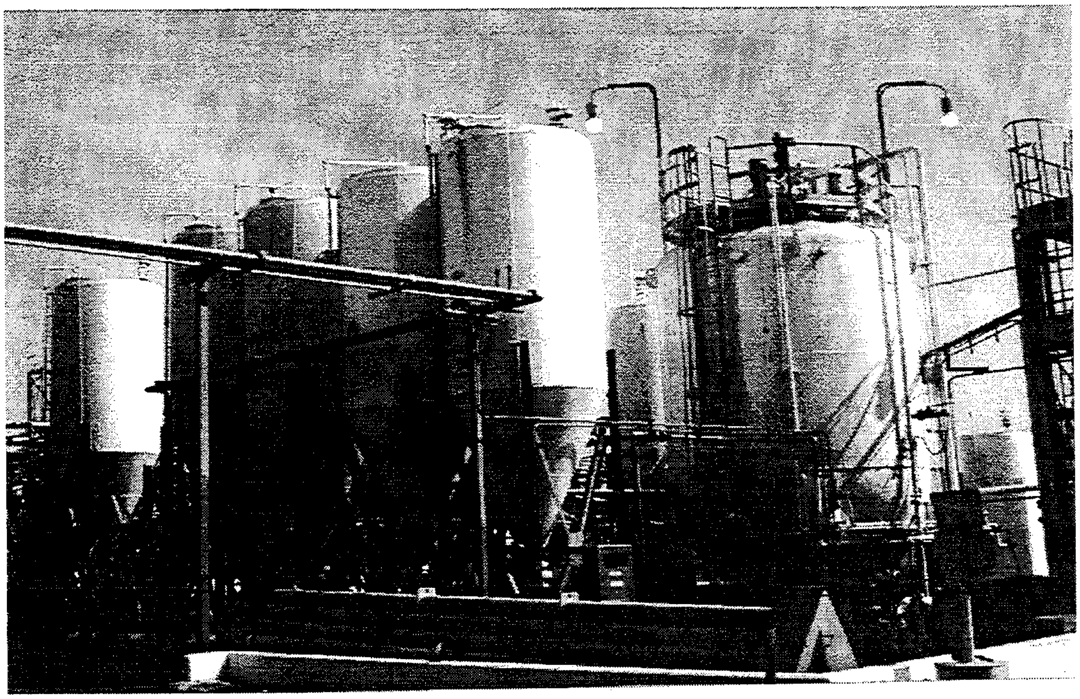


Figure 200.12 View Two of a Solvent Recycling Plant

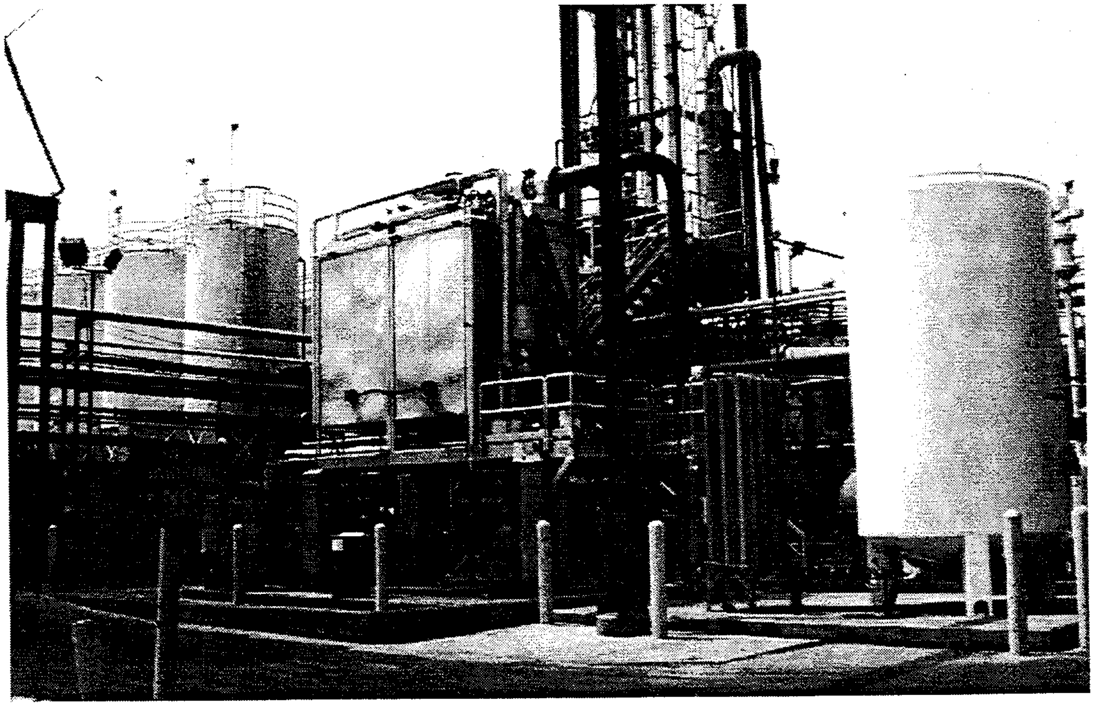


Figure 200.13 View Three of a Solvent Recycling Plant

300 PROCESS AND CONTROL

What's in This Chapter

This chapter describes processes used in solvent operations and methods used to control the resulting emissions. First, processes are presented along with some basic controls which may closely relate to the equipment descriptions. Then, controls are described in more detail.

301 SOLVENT PROCESSES

As previously described, and as summarized in Table 200.1, traditional solvents include petroleum distillates, aliphatic hydrocarbons, aromatic hydrocarbons, chlorinated hydrocarbons, chlorofluorocarbons, ketones, alcohols, etc. Such solvents play an important role during plating, repair, inspection, assembly, heat treatment, machining, or in preparing parts for painting. However, the focus here is *not* on paint thinners, which are covered in CAP *coatings* manuals.

The main operation, **solvent cleaning** or *degreasing* means using *non*-aqueous solvents to remove soils from metal and non-metal surfaces. Solvent cleaning can be divided into **three* major classifications:**

1. **Cold cleaning,** the most common,
2. **Open top vapor degreasing,** and
3. **Conveyorized degreasing.**

Newer Developments

* Engineers of the Bay Area Air Quality Management District have been permitting a new kind of electronics and semiconductor cleaner which does not fit any of these categories. **Enclosed spray processors,** consisting of a spray chamber, solvent tanks, and a pump, are used to clean semiconductor wafers and associated equipment. Control requirements such as freeboard ratios do not readily transfer to these units, but perhaps they could be considered as being similar to enclosed conveyorized cleaners. **Isopropyl alcohol (IPA) vapor dryers** with enclosed chambers are also becoming more common. In these aqueous cleaners, hot IPA gas is introduced after the water is drained out. In some units the gas is collected and recycled, but in other units the gas is not controlled. District control requirements such as Bay Area Rules 16 and 30 will probably adapt to accommodate the constantly evolving technology and equipment.

301.1 COLD CLEANING

Cold cleaning operations use all types of solvents, depending on the type of parts to be cleaned. This is in contrast to vapor degreasers, which tend to use halogenated chlorine and/or fluorine solvents, because they are not flammable and their vapors are much heavier than air.

300 PROCESS AND CONTROL

Cold cleaning processes include spraying, brushing, flushing, and immersion. Occasionally, the solvent in cold cleaners is heated, but never close to its boiling point. Of the three categories of degreasers, cold cleaners emit the most total pollutants because of two factors:

1. The large number of cold cleaning units, and
2. The evaporation from the discarded waste solvent.

Must Not Splash

The simplest type of cold cleaner is the spray sink or hooded booth, as shown in the drawing and the photo, Figures 300.1 and 300.2. Here, dirty parts are manually cleaned by spraying. The low pressure spray must not splash, and the booth is aspirated to a control device such as a carbon absorber.

Dip Tanks Are Simple

For higher levels of cold cleaning, increasingly sophisticated devices are used. There are two basic types, **maintenance** units and **manufacturing** units, but some can serve both tasks. *Maintenance* cold cleaners, such as the dip tanks shown in Figures 300.3 and 300.4, are usually simpler, less expensive, and smaller. They are designed for cleaning metal parts in automotive repair shops and other general plant maintenance, using mainly aliphatic petroleum solvents such as mineral spirits and stoddard solvents. A typical size of such a cleaner is about 4 square feet of opening and about 30 gallons capacity.

Allow Time For Draining

There are several variations of maintenance cold cleaners. The soiled parts may be put in a basket and soaked. Some units use a hoist to lower and raise the basket, and some agitate the solvent to enhance the cleaning action. After cleaning, the basket of parts may be suspended over the solvent and allowed to drain, or the parts may be placed on an external rack which routes the drained solvent back into the tank. The cover is meant to be closed whenever practical.

Another variation of the maintenance cold cleaner is the *enclosed cabinet* spray cleaner with vertically stacked racks, as shown in Figure 300.5.

Manufacturing cold cleaners are used in an integral stage of metalworking production. They must perform a higher quality of cleaning than is required of maintenance cleaners, so their innovative and elegant designs are more closely adapted to their tasks. Although there are fewer manufacturing cold cleaners than maintenance cleaners, they tend to emit more solvent per unit because of the larger size and work load. They use a wide variety of solvents.

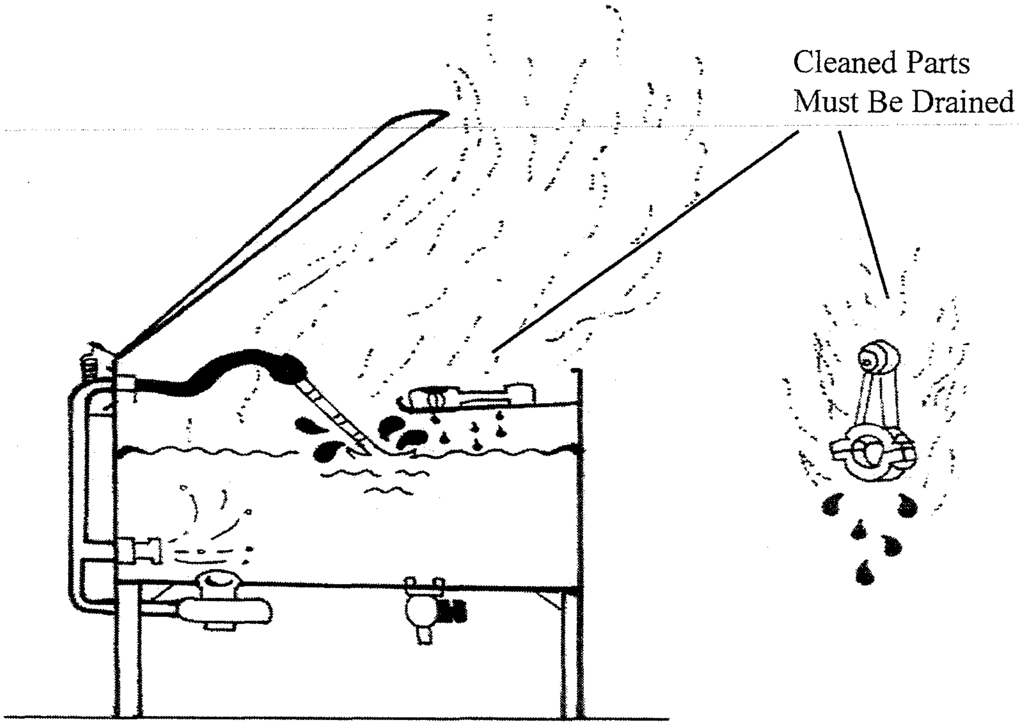


Figure 300.1 A Spray Sink Cold Cleaner

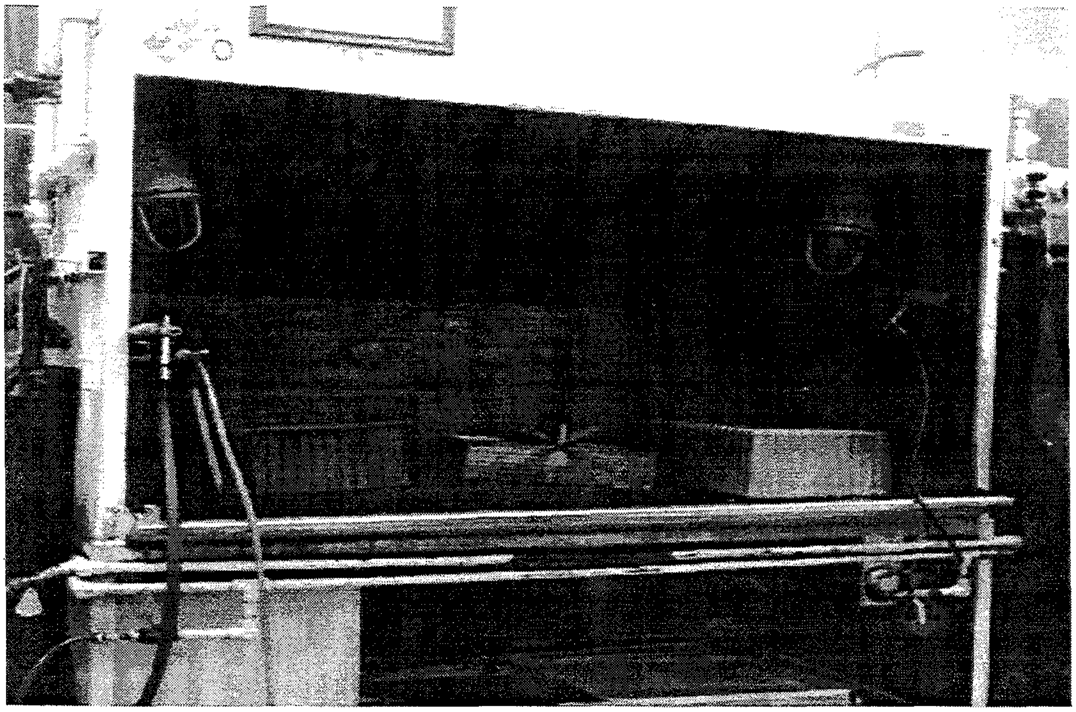
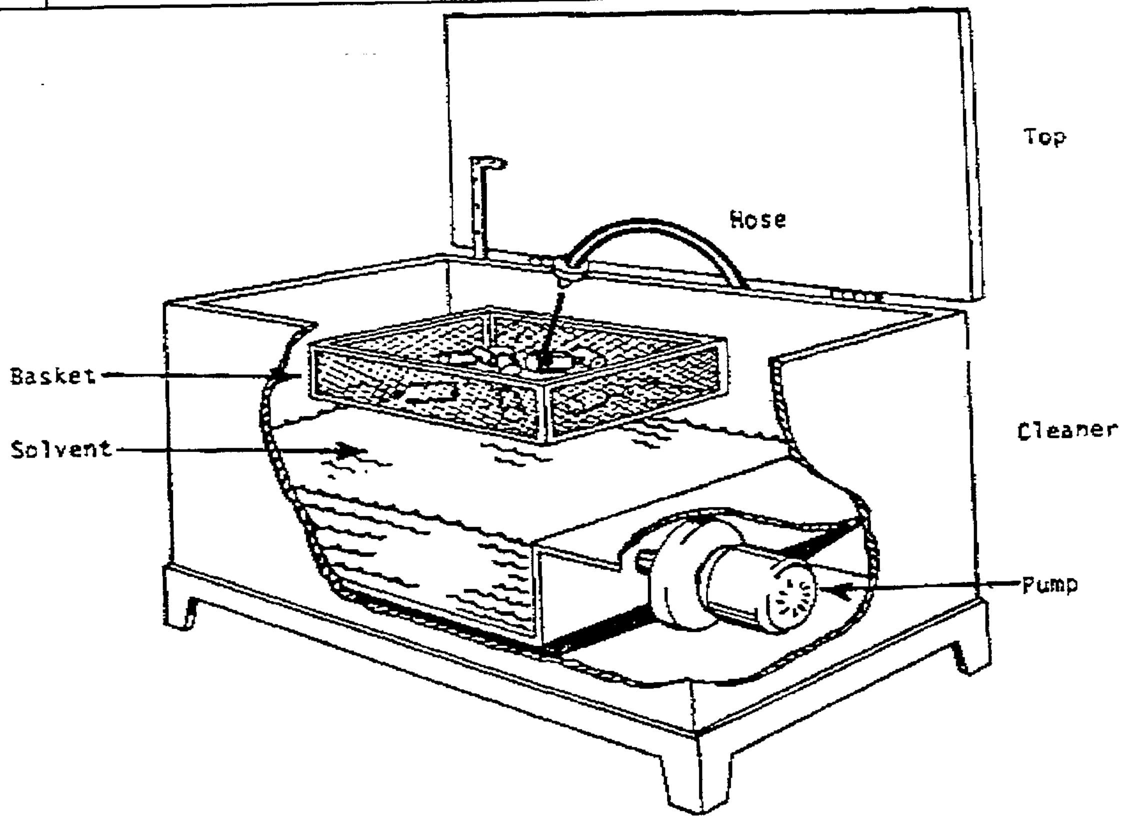


Figure 300.2 A Spray Booth Cold Cleaner



Figures 300.3 and 300.4 Maintenance Cold Cleaners

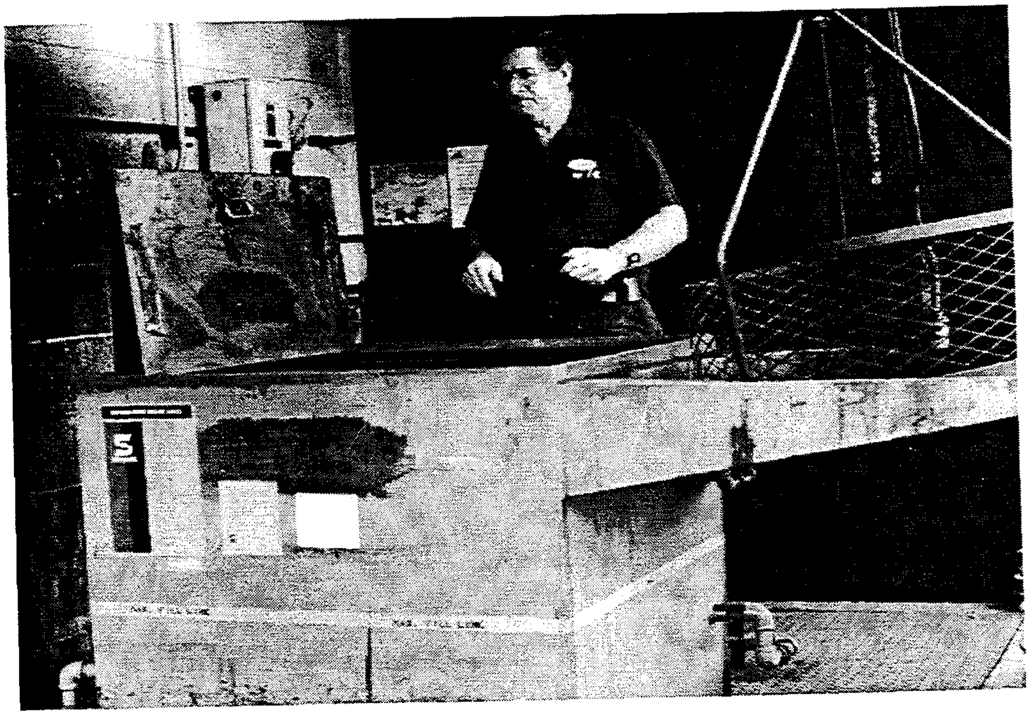


Figure 300.5
An Enclosed Cabinet Vibrated Cold Cleaner

Which type of cold cleaner would be best for your application? You may wish to consider these two main factors: the work load and the degree of cleaning effectiveness you want. Workload involves tank size, frequency of use, and types of parts being cleaned. Larger workloads require larger cleaning devices. The more frequently you use the cold cleaner, the more you could benefit by automating and speeding up the cleaning process. Automating speeds up the system of handling materials, and agitation speeds up cleaning. Also, consider the parts to be cleaned: complex shapes need more thorough cleaning and draining methods.

More Solvency, More Emissions

The required cleaning effectiveness establishes your choice of solvent and the degree of agitation. For greater cleaning effectiveness, you may choose more powerful solvents and more vigorous agitation. **However, these choices will generally increase emissions.** (Higher solvency implies higher volatility.)

Cold Cleaners for Manufacturing

Within the classification of *manufacturing* cold cleaners, designs vary widely for specialized applications. No particular design could be called "typical." Thus, in more specifically classifying manufacturing cold cleaners, we can consider the tank design, agitation technique, and the method of handling the soiled parts.

The two basic tank designs are the simple **spray sink** and the **dip tank**. The spray sink is less expensive and appropriate for simple parts which need not be perfectly cleaned. The dip tank allows dirty parts to be soaked for more thorough cleaning. Dip tanks can also use agitation to improve cleaning efficiency.

Air Agitation Not Allowed

Agitation may be provided by mechanical motion or by using ultrasonics. Air agitation, pumping compressed air into the bottom of the liquid, is generally ***not allowed*** by air pollution control district rules, because solvents would be absorbed into the air stream, increasing emissions. In the pump agitated cold cleaner, the solvent is rapidly circulated in the soaking tank. In the vertically agitated cold cleaner, dirty parts move up and down while submerged.

In the ultrasonically agitated tank, the solvent is vibrated by high frequency sound waves. Ultrasonically agitated liquids often need to be heated to specific temperatures to achieve optimum *cavitation*: the imposition of microscopic vapor cavities in the liquid solvent. These cavities, caused by pressure differentials of the sound waves in the solvent, break down the dirt film on the parts.

How Dirty Parts Are Moved

The **designs for handling parts** in cold cleaning systems are almost endless, but they can be divided into manual and batch loaded conveyorized systems. Manual loading is used for simple, small-scale cleaning operations. Batch loaded conveyorized systems are used in the more complex, larger-scale operations. These systems may include automated dip tanks, which lower, pause, and raise the work load, and roller conveyors to transfer the parts to another operation. Sometimes, two or more dip tanks may be used in series, each tank containing increasingly pure solvent, in a "cascade" system. These consecutive dip tanks may have different cleaning solutions for more complex operations and they may even be combined with vapor cleaning and aqueous systems.

Techniques for handling and moving the soiled parts can be important in reducing emissions from cold cleaning. Regardless of the system, the workloads or parts must be handled so that the solvent has sufficient time to drain from the cleaned parts into an appropriate container.

The cost of solvents makes conservation efforts worthwhile. For the more expensive agents, control equipment can make conservation, recovery, and recycling economical. Some industrial operators use a vendor to service and recycle the solvents in their cleaning units. (See Figure 300.6)

301.2 OPEN TOP VAPOR CLEANING

After cold cleaners, open top vapor degreasers cause the next highest controlled emissions of the three categories of solvent cleaners. Vapor degreasers produce the hot *vapor state* of a solvent, which condenses on the soiled parts, surrounds the impurities, and dissolves them. The selected solvents boil at much lower temperatures than do the contaminants. Consequently, when the solvent/soil mixture boils in the tank, it gives off the more volatile elements, producing an essentially pure solvent vapor.

Emission Control

Emissions control: The vapor is contained within the tank by its temperature-controlled negative buoyancy. As depicted in Figure 300.7, the tank construction includes a heating element near the bottom to heat the solvent to the vapor state. A ***cooling coil*** located around the inner perimeter near the top of the tank cools the vapor to keep it from rising above the coil. The vapor layer thus remains above the liquid solvent and below the top of the cooling coil.

Freeboard: A Buffer Zone

Control is further enhanced by a *freeboard* extending about six inches above the cooling coil to contain any energetic solvent elements which might try to leap out. As shown in Figure 300.8, the ***freeboard ratio*** is a measure of the opportunity for solvent emissions to escape. Districts typically require this ratio, the freeboard divided by the tank width, to be **less than or equal to 75%.** Finally, the tank is to be covered when not in use. (Close the open-top cleaner.)

300 PROCESS AND CONTROL

This service agent represents a well-known solvent vending company. He has arrived at an aircraft parts factory with a supply of fresh solvent to replace used or spent solvent in the cold cleaning devices owned or leased by the factory. He removes the spent solvent for recycling or, occasionally, for disposal. It is classified and handled as hazardous waste, including labeling, manifesting, and transporting by an authorized carrier. His services provide a convenience to the factory, including responsibility for some of the administrative and special handling requirements. Due to the specialized routine of this solvent vending company, it *may* be allowed to use streamlined "milk run" handling procedures.

Figure 300.6 A Vendor Services A Typical Cold Cleaner

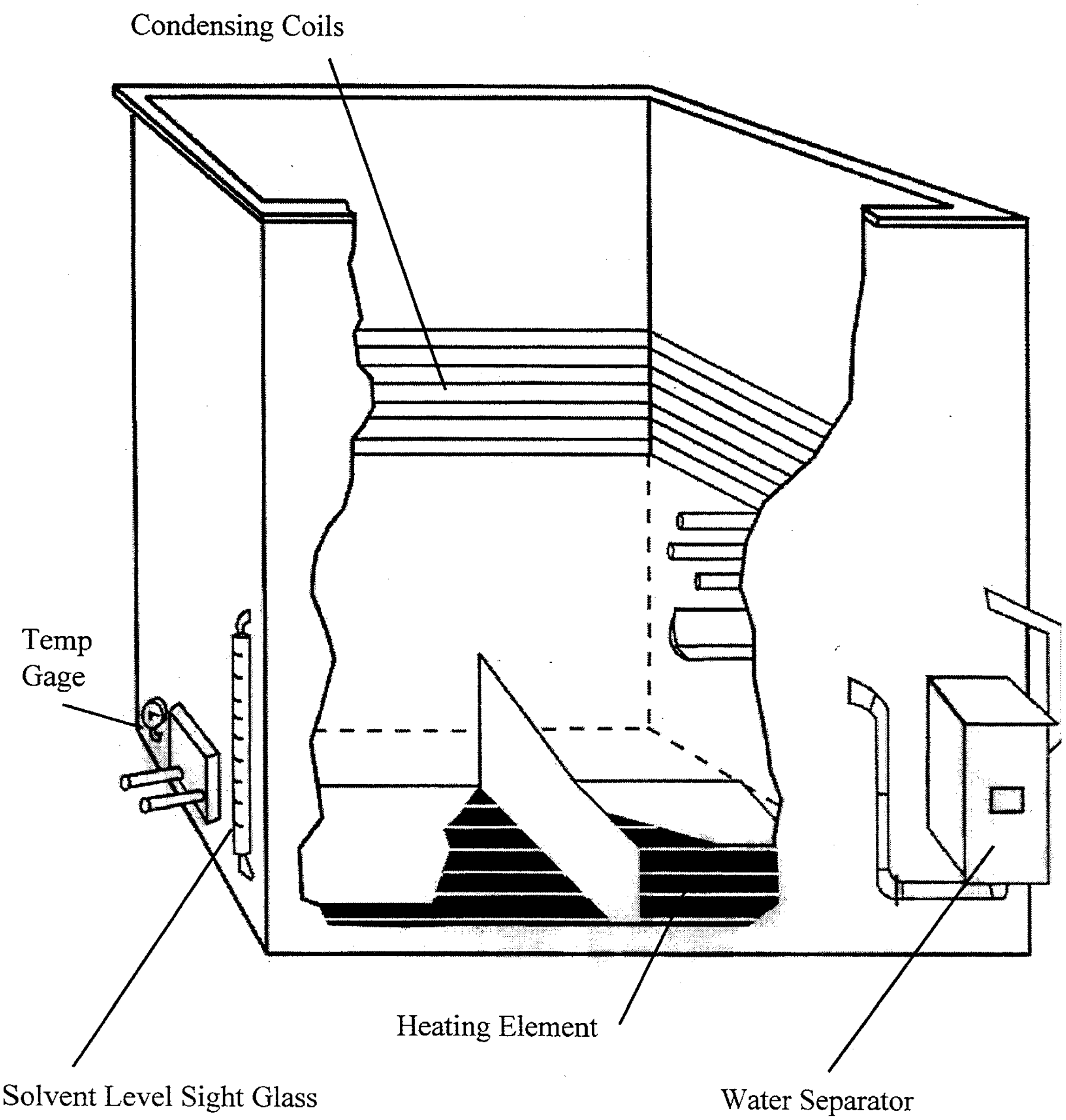
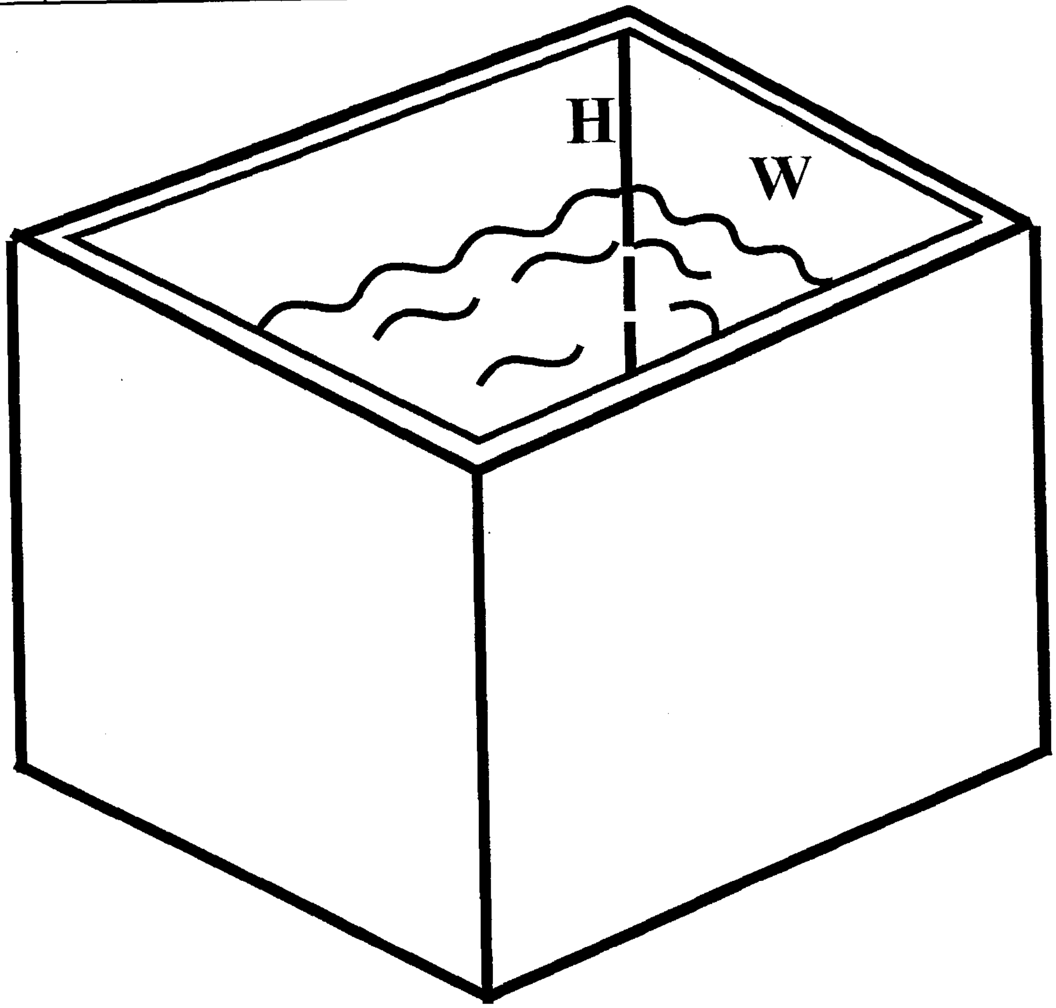


Figure 300.7 Basic Features Of A Vapor Degreaser



Freeboard Ratio $\geqq$ $\frac{\text{Height}}{\text{Width}}$

(Must not be less than 0.75)

W = the least ***inner*** width across the top rim of the enclosure, and

H = the distance from **top of *vapor* to top of rim,**

or

the distance from **top of *liquid* to top of rim**, whichever is less.

Figure 300.8 Freeboard Ratio

Open top vapor degreasers are batch loaded, i.e., they clean only one load at a time. Objects to be cleaned, such as aircraft hydraulic actuators, are placed in a metal basket and lowered by winch into a tank. **A simple cleaning cycle** for an open top vapor cleaner might be like this:

Allow Time For Draining

- Put soiled parts into a metal basket.
- Lower the basket by winch into the vapor zone of the tank, so that the condensation action can begin.
- When condensation ceases, ***slowly*** winch the parts up, out of the tank.
- Allow the parts to dry. The residual liquid solvent on the parts rapidly evaporates as the parts are removed from the vapor zone.

Automated, Timed Cycle

Variations: The cleaning action is often increased by spraying the parts with solvent within the vapor layer or by immersing them into the liquid solvent bath from the tank. A fan may also skim air off the top of the tank and vent it into a control device. In order to assure adequate draining time, some vapor degreasers use an automated timed cycle. (Please see Figure 300.9.)

Open Top Vapor Degreasers, Continued

Typical open top vapor degreasers are tanks designed to produce and contain solvent vapor. At least one section of the tank is equipped with a heating element that uses steam, electricity, or fuel combustion to boil the solvent. As the solvent boils, its dense vapor displaces the air within the tank. To confine this vapor within the tank, condenser coils are usually located near the top of the tank, around its entire inner perimeter. These coils are supplied with a coolant such as water. Most vapor degreasers also have a water jacket to provide additional cooling to prevent the vapors from rising up the tank walls.

Freeboard: a Buffer Zone

The cooling coils must be placed well below the top edge of the degreaser to protect the solvent vapor zone from disturbance caused by air movement around the equipment. This distance from the top of the vapor zone to the top of the degreaser tank is called the ***freeboard*** and is generally established by the location of the condenser coils. The freeboard is customarily 50 to 60% of the width of the degreaser for solvents with higher boiling points, such as perchloroethylene, trichloroethylene, and 1,1,1-trichloroethane.

For solvents with *lower* boiling points, such as trichlorotrifluoroethane and methylene chloride, degreasers have been designed with a freeboard no less than 75% of the degreaser width. APCD rules usually require at least 75%. Higher freeboards than those recommended will further reduce solvent emissions, but significantly higher freeboards can interfere with the operation.

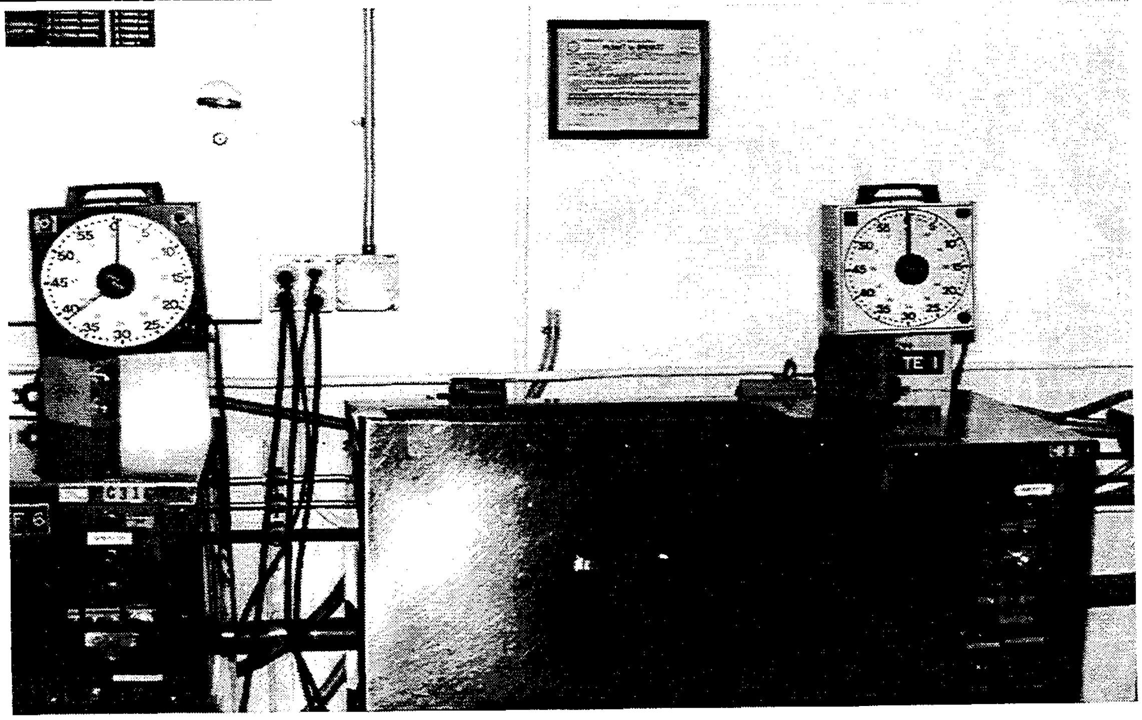


Figure 300.9 Timed - Cycle Vapor Degreasers

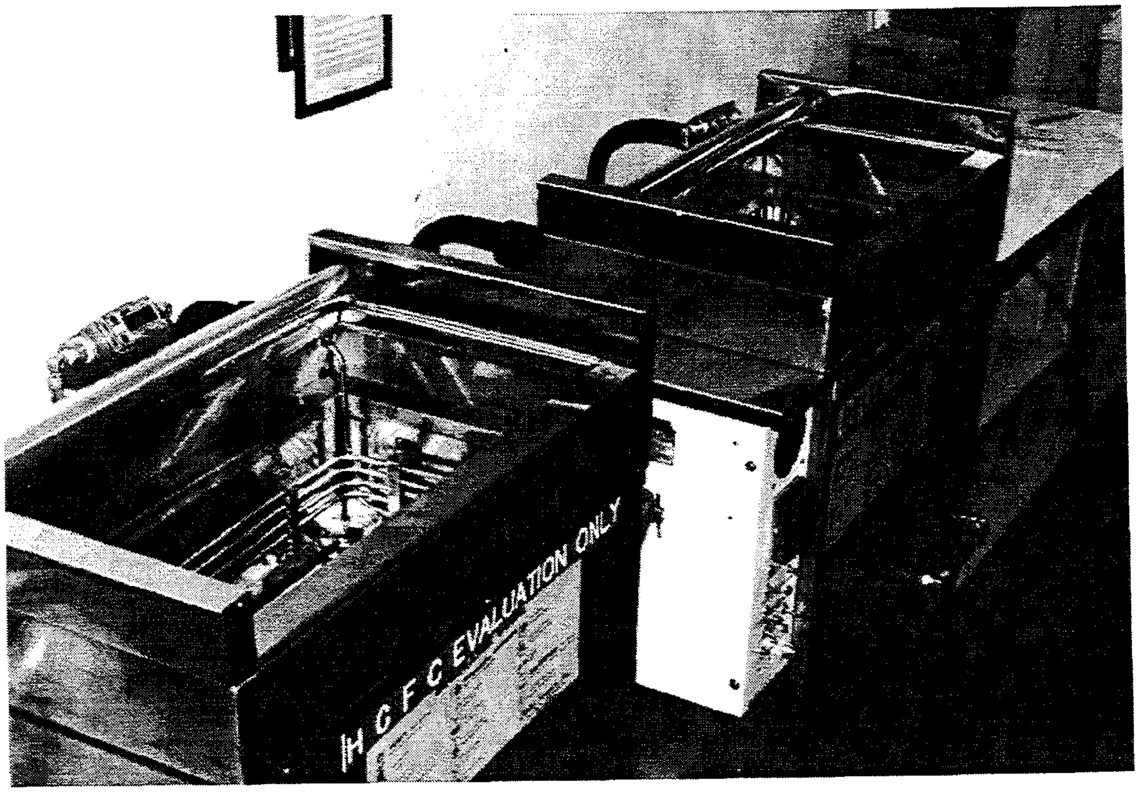


Figure 300.10 Typical Vapor Degreasers

Nearly all vapor degreasers are equipped with a water separator such as the one already depicted in Figure 300.7. The condensed solvent and moisture are collected in a trough below the condenser coils and directed to the water separator, a simple container which allows the less dense water to float to the top and then decant from the system. The solvent flows from the bottom of the chamber into the vapor degreaser. Water is *immiscible*: it does not mix with the solvent.

Water Is Immiscible

Figure 300.10 shows a popular type of open top vapor degreaser. These units range from table top models, measuring 2 feet long and 1 foot wide, to larger units of 10 feet by 6 feet. A typical unit is about 6 feet by 3 feet.

Covers: In the past, the unhinged, single-piece metal covers for the smaller degreasers have been inconvenient to use. As a result, these degreasers have often been left open, except during prolonged idle periods such as weekends. Now, however, small units are usually equipped with manually operated, roll-type plastic covers, canvas curtains, or hinged, counterbalanced metal covers. Larger units usually have segmented metal covers. Finally, most of the largest open top vapor degreasers with surface areas of 200 square feet or more, and even some of the smaller degreasers, have manually controlled, *powered* covers.

Some open top vapor degreasers have *lip exhausts* near the upper rim. Exhaust systems do cause some solvent losses, but they are designed to capture errant vapors and carry them away from operating personnel. For properly designed exhaust systems, the covers must close below the lip exhaust inlet level.

Lip Exhausts To Protect People

Open top vapor degreasers are not usually used for ordinary maintenance cleaning of metal parts, because *cold* cleaners can usually do that at a lower cost. Consequently, open top vapor degreasers are found primarily in the larger metal working and electronics plants in applications which need a high degree of cleanliness. The units are usually situated near the articles to be cleaned and at convenient sites in the plant. They operate manually and are typically used for only a small portion of the workday.

301.3 CONVEYORIZED CLEANING

Conveyors Cost More, Do More

In contrast to the methods already described, *conveyorized* cleaners cost more. They are used by a broad spectrum of metal working industries, but are most often found in plants with enough production to provide a constant stream of products to be degreased. The units tend to be located at central cleaning stations in the plant, requiring that soiled parts must be collected and delivered to the machine for cleaning, but most or all of the manual parts handling associated with open top vapor degreasing is eliminated.

Large Work Capacity

Conveyorized degreasers use cold solvents or vapor. Controlled emissions from an average device are about 25 metric tons per year, but that is only about 15% of the total solvent degreasing emissions because of their limited numbers. Due to their large work capacity, conveyorized degreasers actually emit less solvent per part cleaned than either open top vapor degreasers or cold cleaners. Further, conveyorized units are nearly always hooded or covered, which diminishes solvent losses from the system into the ambient air of the plant.

Seven Types of Conveyors

There are seven main types of conveyorized degreasers:

Monorail	Cross-rod	Vibra	Ferris wheel
Belt	Strip	Circuit board	

While most of the seven types of conveyorized degreasers may use cold solvent or vapor, the top four almost always use vapor.

Cross-Rod Degreaser

The cross-rod degreaser (Figure 300.11) obtains its name from the rods between the two power driven chains from which parts are supported as they are conveyed through the equipment. The parts are contained in pendant baskets or, where tumbling of the parts is desired, perforated cylinders. These cylinders are rotated by a rack and pinion design within the solvent and/or vapor zone. This type of equipment lends itself particularly well to handling small parts which need to be immersed in solvent to obtain satisfactory cleaning or require tumbling to provide solvent drainage from cavities in the parts.

Monorail

A monorail degreaser (Figure 300.12) is usually chosen when the parts to be cleaned are being transported between manufacturing operations using a monorail conveyor. This design lends itself to automatic cleaning with solvent spray and vapor. The parts can be moved in one side and out the other side, or they can turn 180 degrees while in the vapor or spray portion of the equipment and exit the equipment through a tunnel parallel to the entrance.

Vibra Degreaser

Hardly any vibra degreasers are still in use. (Figure 300.13) In this device, dirty parts are fed through a chute which directs them into a pan flooded with solvent. The pan is connected to a spiral elevator. The pan and spiral elevator are vibrated, causing the parts to move from the pan up the spiral to the exit chute. The parts condense solvent vapor as they are vibrated up the spiral and dry as soon as they leave the vapor zone.

Figures 300.11 through 300.16 depict several types of conveyorized degreasers.

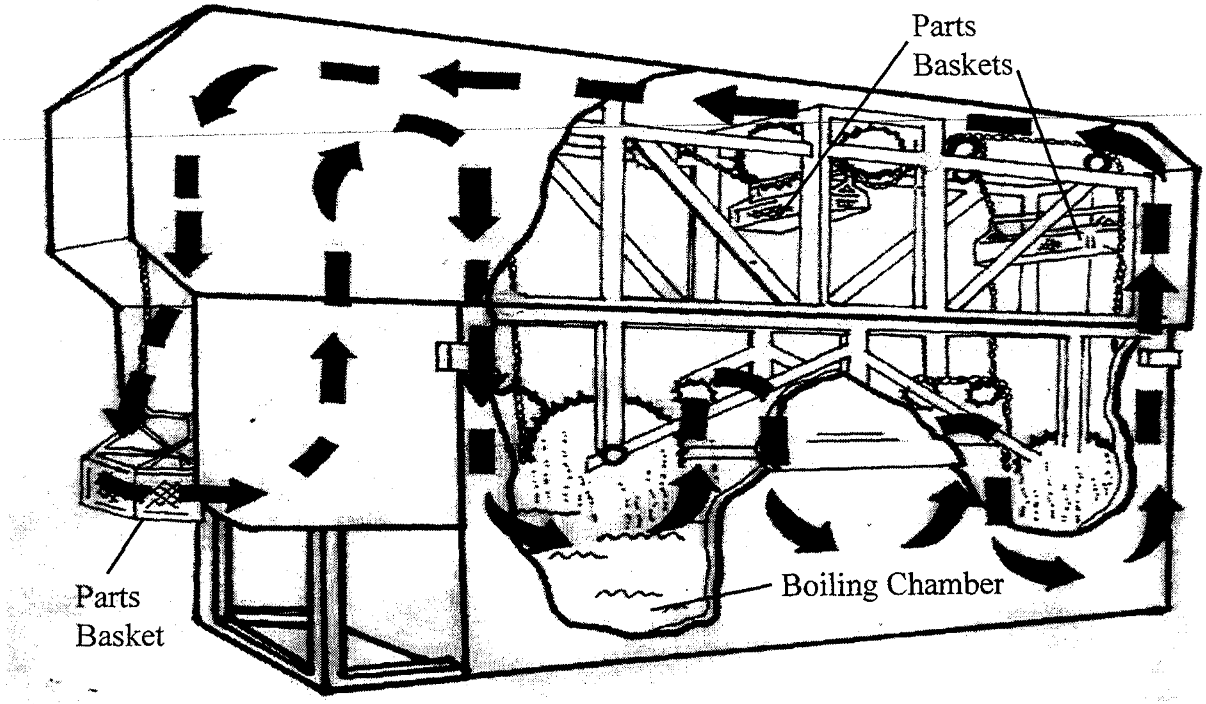


Figure 300.11 Cross Rod Conveyorized Degreaser

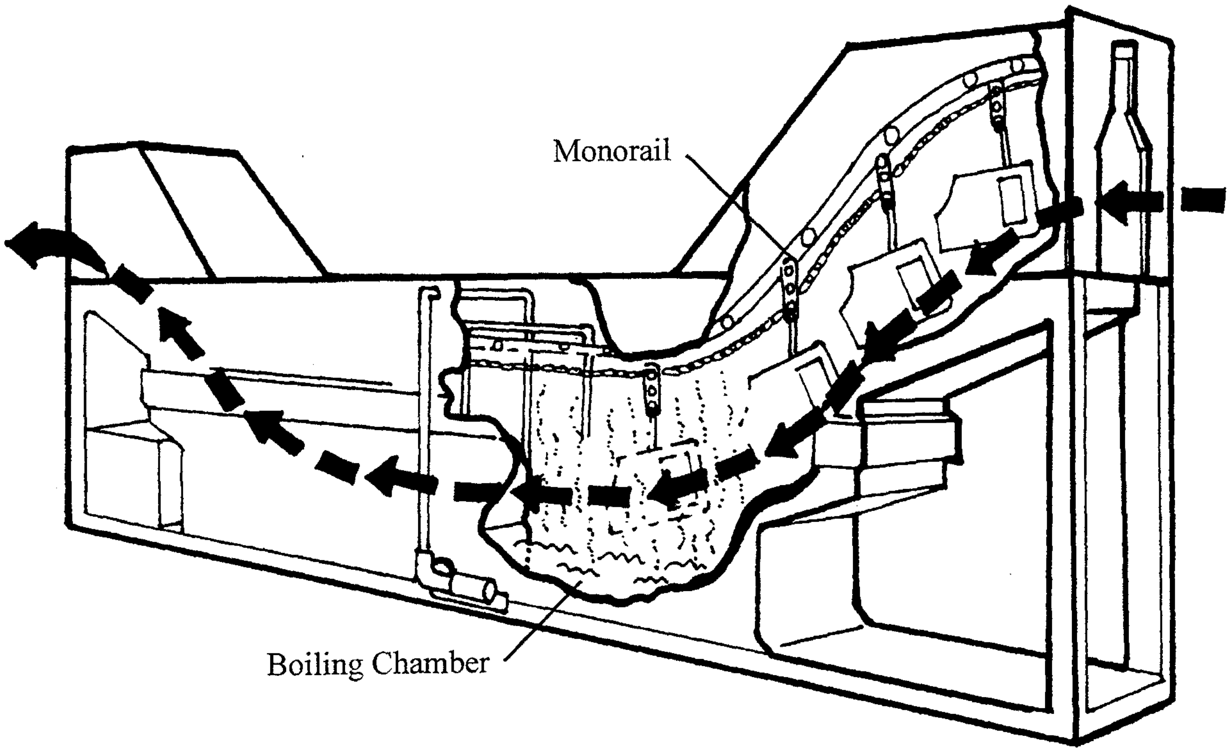


Figure 300.12 Monorail Conveyorized Degreaser

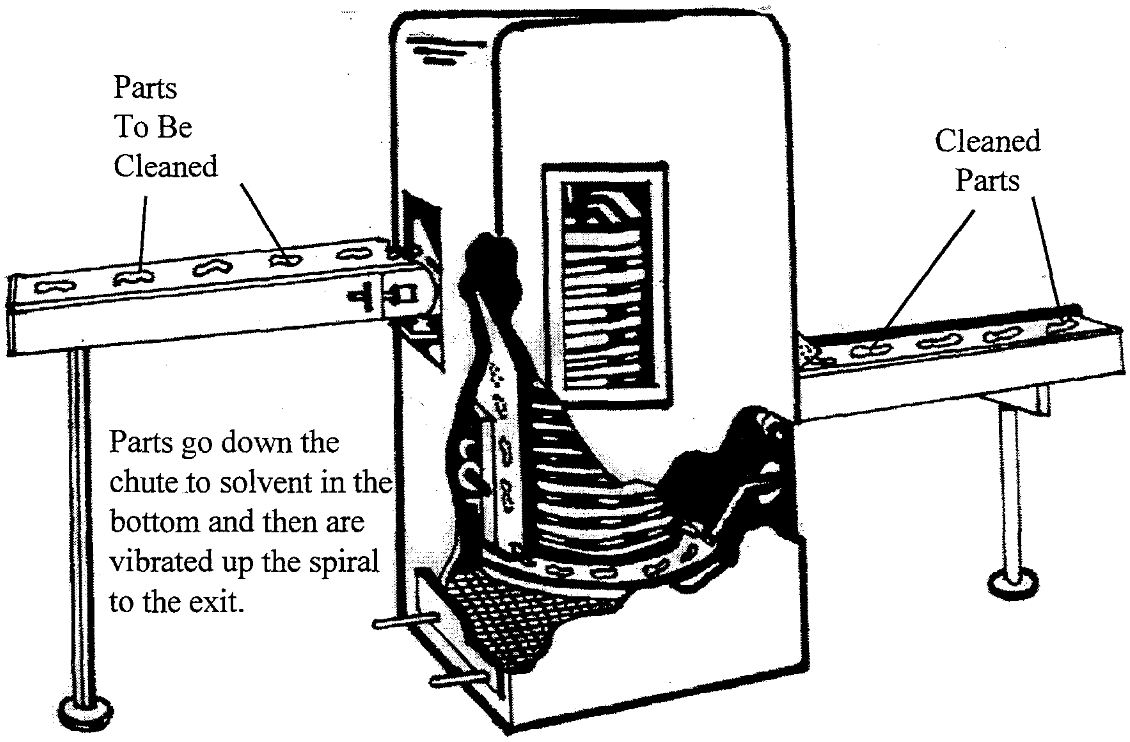


Figure 300.13 Vibra Conveyorized Degreaser

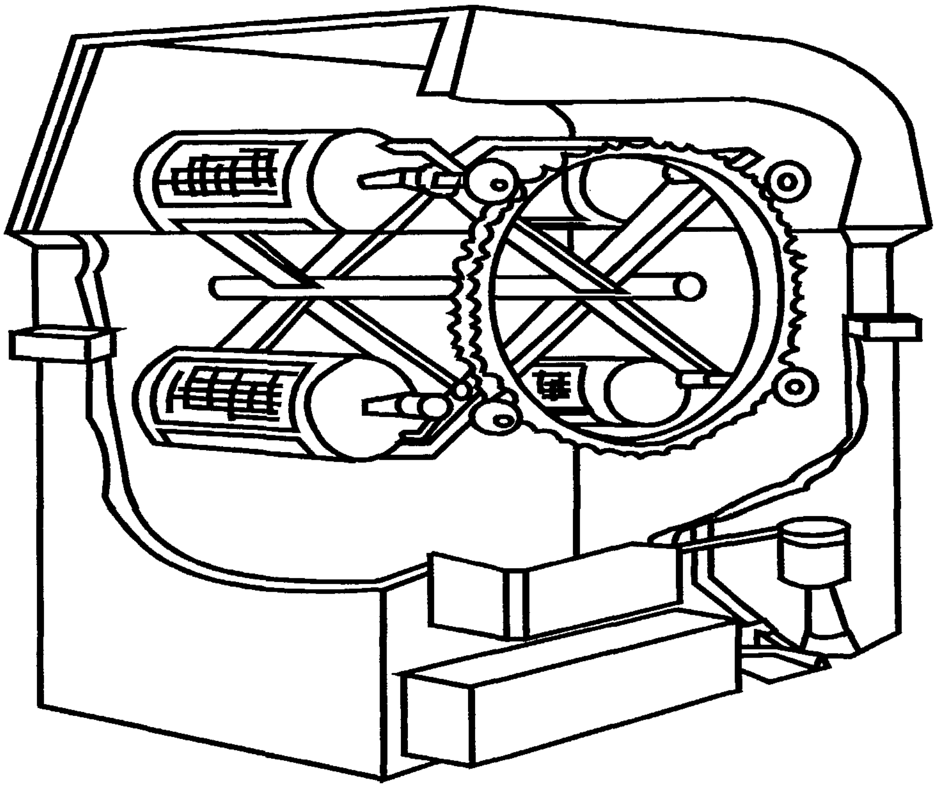


Figure 300.14 Ferris Wheel Conveyorized Degreaser

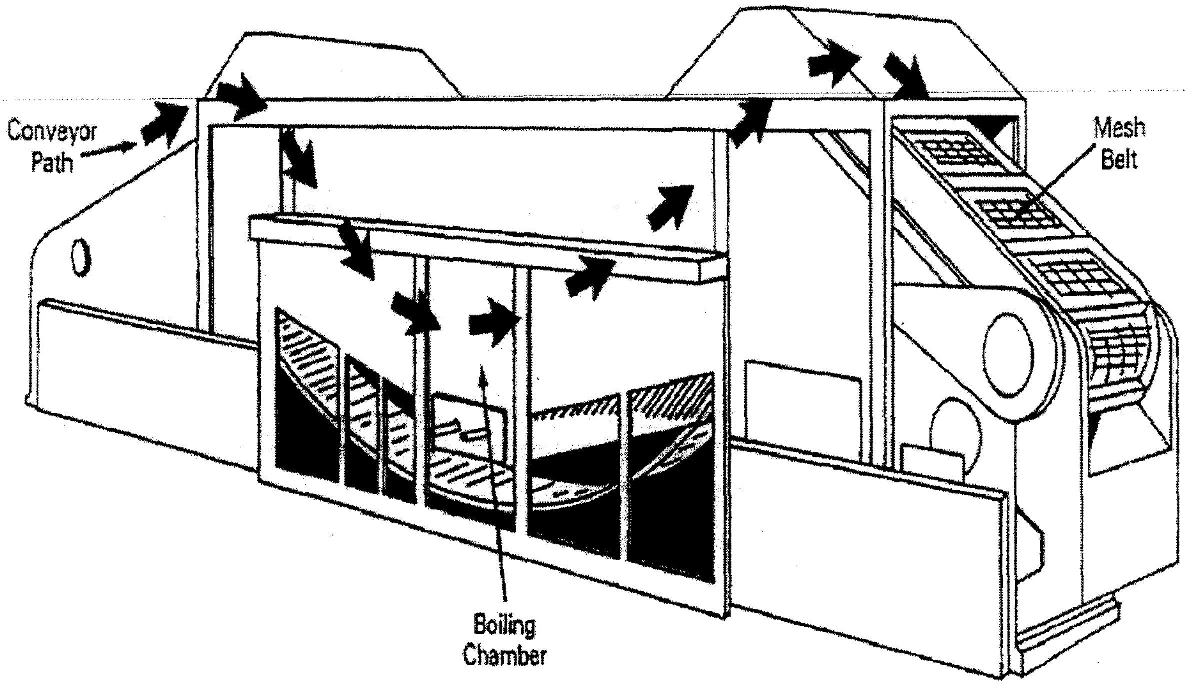


Figure 300.15 Conveyor Belt Degreaser

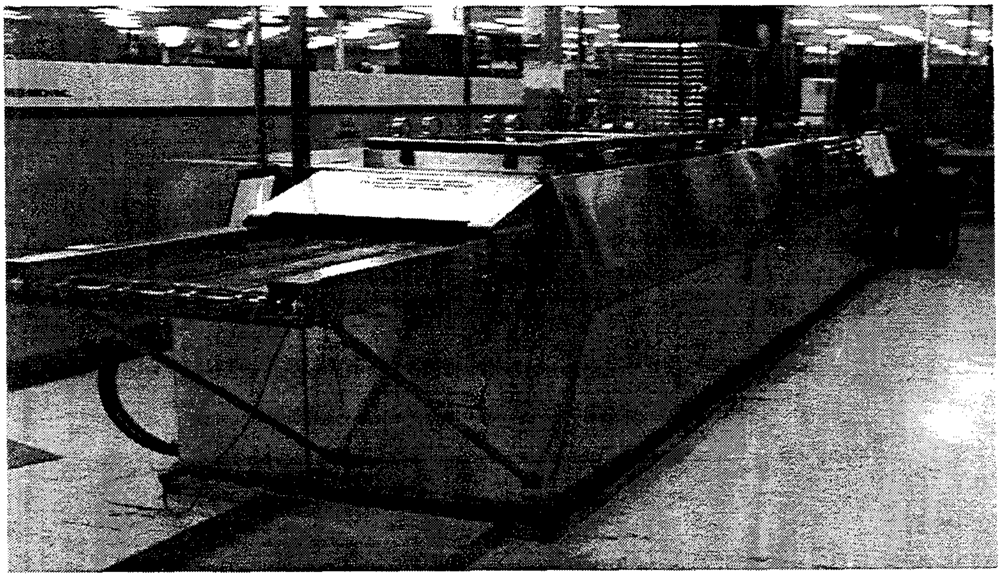


Figure 300.16 Flat Bed Conveyor Belt Degreaser

Vibra Degreaser (Continued)

These vibra degreasers are capable of processing quantities of small parts. Since the vibratory action creates considerable noise, acoustical insulation of the equipment is needed or the system must be enclosed in a noise-control booth.

Ferris Wheel

Three other typical units are the ferris wheel, belt, and strip degreasers. The ferris wheel type (Figure 300.14) is one of the least expensive and smallest conveyorized units. It generally uses perforated baskets, as does the cross-rod machine. Belt degreasers (Figures 300.15 and 300.16) are designed to enable simple and rapid loading and unloading of parts. A strip degreaser resembles a belt degreaser, except that the strip itself is being cleaned. The strip degreaser is an integral step in the fabrication and coating of some sheet metal products.

Circuit Boards

Conveyorized degreasers are often used in the production of printed circuit boards. Two types of circuit board cleaners are developers and strippers. During circuit board manufacturing, ultraviolet rays are projected through a film of an electrical circuit pattern to create an image on a copper sheet covered with a protective layer of maskant called *resist*. The developer degreaser dissolves and cleans off the unexposed resist. This copper covered board is then dipped in an acid bath to etch away the copper that is not covered by the hard, developed resist. Next, the stripper degreaser dissolves off the flux left after the solder hardens. Because of the nature of the materials being cleaned, circuit board cleaners can use cold solvents or vapor degreasing processes.

302 OPPORTUNITIES TO REDUCE EMISSIONS

Solvent cleaning is a significant source of volatile organic compound (VOC) emissions, mainly concentrated in urban areas where the ozone standards are likely to be exceeded. As described in the previous chapter, solvent cleaning in California causes over 20,000 tons of controlled VOC emissions per year. (Source: ARB Emission Inventory) Reducing solvent losses from cleaning operations can not only reduce VOC emissions, but can also lower toxic exposure to workers and to the public.

Control technology is available to reduce these emissions. In the past, ozone control strategies have relied on the substitution of solvents with relatively low photochemical reactivity to reduce emissions of VOC having higher reactivity. Thus, total emissions did not necessarily decrease; only the content of those emissions changed. One problem with that approach is that many solvents formerly classed as low reactivity materials have since been found to be moderately or highly reactive downwind of the emission point.

Reduce *Total* Emissions

The current strategy of reducing *total* emissions rather than merely converting to the same volume of solvents with lower reactivity could also help to solve another problem: ozone depletion. In 1979, an international conference of environmental scientists decided that some low reactivity chlorinated solvents should be phased out, because they deplete the protective ozone layer in the upper atmosphere. This agreement is known as the Montreal Protocol.

Montreal Protocol

Proper operating practices and control equipment can indeed play important roles in reducing emissions from solvent cleaning. Proper operating practices include covering degreasing equipment whenever possible, limiting the loss from spraying operations, draining cleaned parts, prompt repair of leaking equipment, and most important, proper disposal of wastes containing VOC. What does control equipment include?

303 CONTROL TECHNOLOGY

This section describes emission control devices for solvent degreasers, and it provides estimates of the control efficiency (percent emission reduction) of some individual control devices.

Control Devices

Various devices are used to control emissions, the type of control depending on the degreaser design and its use. Small degreasers using solvent at room temperature may require only a cover, whereas a large degreaser using boiling solvent may require a refrigerated freeboard chiller and/or a carbon adsorption system.

Note that optimum control systems will not be equivalent for each degreaser design or even for each application of a particular design. Even though all of the major devices described in this subsection will yield optimum control in certain instances, degreaser designs and applications vary, so that some devices could be completely unsuitable for a given degreaser. Each process and application must be evaluated to determine its own optimum control system, since the nature of each system is unique.

The efficiencies for control devices estimated in this subsection are not directly comparable with efficiencies for other devices; they are not intended to be used to rate one device against another. They are given only as general levels of control which could be expected from the technology.

303.1 SOLVENT BATH EMISSIONS

These five main devices can reduce emissions from the solvent bath:

- Improved cover,
- High freeboard,
- Refrigerated chillers,
- Carbon adsorption,
- Safety switches.

Covers Are Most Important

Improved Cover: The cover is the *single most important* control device for open top vapor degreasers. Covers are normally provided as standard equipment, but some covers are not convenient to use. Covers are more frequently closed if their method of actuation is improved to provide automation, power, or at least mechanical assistance.

For vapor degreasers the cover should open and close in a horizontal motion, so that the air/vapor interface disturbance is minimized. These types of covers include roll type plastic, canvas curtains and guillotine covers. They are often power operated, either pneumatically or electrically, and manually controlled with automatic shut off. The most advanced covering systems are automated in coordination with the hoist or conveyor. The cover can also be designed to close while the parts are being cleaned and dried. Thus, the cover would be open only for a brief time while the parts are entering or exiting the degreaser.

On cold cleaners, covers are frequently mechanically assisted by means of spring loading or counter weighting. A pedal operated or powered system is even more convenient to use. For specific applications, two additional types of covers can be used: the water cover and the submerged cover.

Water Cover

Some solvents are less dense than water. To test *your* solvent, you could pour some into a jelly jar, add water, and see which one comes to the top. Some cleaning units to use a layer of heavier water underneath the solvent to trap sludge, which settles to the bottom and could be drained. Conversely, denser solvents can accommodate a *water cover*, which is simply a layer of water about two to four inches thick over the top of the solvent. However, some applications cannot use the water cover, because the water may corrode the cleaned metal parts or may cause chemical degradation of a halogenated solvent.

The submerged cover, or turbulence baffle, is a horizontal sheet of material about two inches below the surface of a vigorously pump agitated liquid solvent.

Covers on cold cleaners which use flammable solvents usually have a fusible link in the support arm. This link is designed to open if the solvent were to catch fire, allowing the cover to close and smother the flames. Unfortunately, some designs require disassembly of the mechanism for normal closure; this inconvenience often leads to covers being left open and unnecessary emissions.

Not all cold cleaner designs include a soaking feature. Some of the smaller maintenance units are designed with an enclosed sump from which solvent is pumped to a sink for cleaning parts. The sink drains back to the sump, to minimize the time during which solvent is exposed for evaporation. Although the solvent is contained, these units usually include a cover on the sink as a fire prevention feature.

Even though conveyorized degreasers are covered by their basic design, additional control can be achieved by minimizing the size and number of openings and covering the openings during shutdown hours. There should not be more than 6 inches clearance between the parts on the conveyor and the sides of the opening. This clearance is defined as the average distance between the edge of the openings and the parts. This "average silhouette clearance" can be appreciably less than 6 inches for most parts, and the EPA recommends that it be 4 inches or 10% of the opening's width.

Covers can be easily made for the entrance and exit to the conveyorized degreaser so that they can be closed immediately after shutting down the degreaser. These covers can be made of any material that impedes drafts into the degreaser and should cover at least 80 to 90% of the opening. Closing these covers is most important during the hours immediately after shutdown, because the hot solvent is cooling and evaporation continues. Even after the solvent sump has cooled, the downtime cover may be significantly effective for more volatile vapor degreasing solvents.

A cover on an open top vapor degreaser can reduce total emissions by approximately 20-40%, depending upon the frequency of its use. It is impossible to estimate a single control efficiency for the cold cleaning cover, because the emission reduction varies too greatly with respect to the solvent volatility, draft velocity, freeboard ratio, operating temperature and agitation. However, it can be estimated that the bath evaporation rate varies directly with the solvent volatility at operating temperature.

Although a closed cover can nearly eliminate the bath evaporation, it can do nothing to reduce the carry-out or waste solvent emissions. A normally closed cover becomes effective only when bath evaporation accounts for an appreciable portion of the total emissions. Specifically, when solvent volatility is moderate to high (approximately > 0.3 psi at 100 degrees F), it is significantly effective to close the cold cleaner cover whenever parts are not being cleaned manually.

Close The Covers

It is especially important that the cover be closed when the bath is agitated or heated. If none of these conditions apply, then the cover should be closed at least during long idle periods such as during shutdown hours and idle periods greater than 1/2 hour.

Cover For Downtime

The effectiveness of a downtime cover on conveyorized degreasers should be significant, although it is difficult to quantify. One test found that about 18% of the total emissions was due to evaporation during downtime. It is expected that most of this loss could be eliminated by a downtime cover.

High freeboard: The freeboard, which is essentially the distance from the top of the solvent to the top of the tank rim, primarily serves to reduce drafts near the air/solvent interface. An acceptable height is usually specified in terms of the ***freeboard ratio:*** the freeboard divided by the width of the tank rim. For details, please see Figures 300.8 and 400.1.

Freeboard Ratio

Normally, the freeboard ratio has been 0.5 to 0.6 for an *open top vapor* degreaser, except for very volatile solvents, such as methylene chloride or fluorocarbon solvents, where a minimum freeboard ratio of 0.75 is used. In fact, the American Society for Testing and Materials (ASTM) has recommended that a minimum freeboard ratio of 0.75 be an alternative control for open top degreasers using all solvents.

For an open top vapor degreaser that is idling (has no work load), the emission reduction from raising the freeboard ratio from 0.5 to 0.75 may typically be 25-30%. In fact, a ratio increase from 0.5 to 1.0 may yield about a 50% reduction in emissions. These are EPA estimates based on a test by Dow Chemical. The total emission reduction due to the freeboard will usually be less for open top vapor degreasers under normal work load, because the freeboard is less effective in reducing carry-out emissions than in reducing solvent bath emissions.

The freeboard height seems to have little effect on cold cleaners using solvents with low volatilities, such as mineral spirits, but provides significant benefits for cold cleaners using higher volatility solvents, such as the halogenated ones. The Occupational Safety and Health Administration (OSHA) requires at least a 6 inch freeboard for all cold cleaners.

Refrigerated Chiller: The condenser coils and a freeboard water jacket prevent vapors created within a vapor degreaser from overflowing the top.

Refrigerated freeboard chillers add to this basic system a second set of condenser coils located slightly above the primary condenser, as in Figure 300.17.

Refrigerated Freeboard Chillers

Functionally, the primary condenser coils control the upper limit of the vapor zone. The refrigerated freeboard chilling coils, on the other hand, impede the diffusion of the solvent vapors from the work zone into the work atmosphere by chilling the air immediately above the vapor zone and creating a cold air blanket. The cold air blanket results in a sharper temperature gradient. This reduces the mixing of air and solvent vapors by narrowing the air/vapor mixing zone. Finally, the chilling produces a stable inversion layer which decreases the upward convection of solvent laden air.

Freeboard chillers operate with refrigerant temperatures in the range of -30 to 5 degrees C. Most major manufacturers of vapor degreasing equipment offer both above and below freezing freeboard chillers.

The recommended operating temperature for *below* freezing chillers is -30 to -25 degrees C. Because of these low temperatures, designs must include a timed defrost cycle to remove the ice from the coils and restore the heat exchange efficiency. Although the liquid water formed during the defrost cycle is directed to the water separator, in some systems water does contaminate the vapor degreasing solvent. This contamination can have an adverse effect on water soluble stabilizer systems, but it rarely causes major stabilizer depletions. Water also leads to equipment corrosion, shortening its working life significantly.

Refrigerated freeboard chillers are normally sized by specifying the cooling capacity per length of perimeter. The *above* freezing refrigerated freeboard chiller is normally designed to achieve a minimum of 500 BTU/hr cooling capacity per foot of air/vapor interface perimeter, while the below freezing refrigerated freeboard chiller is normally designed to these specifications:

Degreaser Width	Minimum Cooling Capacity (BTU/hr ft of perimeter)
< 3.5 ft	200
> 3.5 ft	300
> 6.0 ft	400
> 8.0 ft	500
>10.0 ft	600

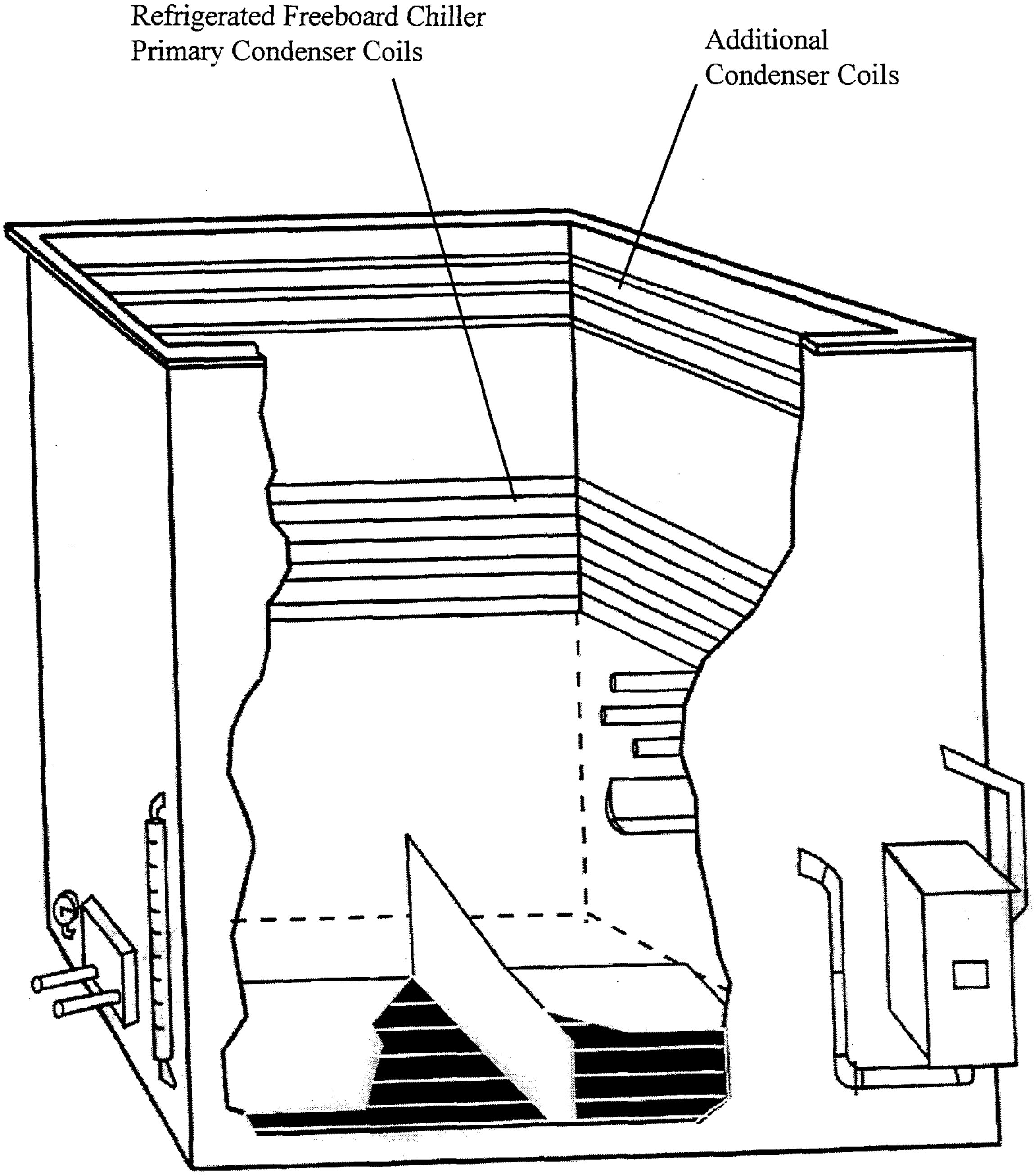


Figure 300.17 Refrigerated Freeboard Chiller

Normally each pass of finned cooling coil is expected to remove 100 Btu/hr-ft. The previous specifications are typical design standards used by manufacturers of chillers. EPA test data indicate that these design standards will provide satisfactory emission control, but at present the data are insufficient to confirm that they yield optimum emission control.

Freeboard Chillers, Continued

A third type of refrigerated chiller is available, known as the **refrigerated condenser coil.** Instead of providing an extra set of chilling coils, as a freeboard chiller does, this type replaces the primary condenser coils. When coolant in the coils is refrigerated enough, it will create a layer of cold air above the air / vapor interface. For optimum emission control, DuPont and Rucker Ultrasonics have recommended that the cooling rate of refrigerated condenser coils be 100-120% of the heat input rate in the boiling sump.

Refrigerated condenser coils are normally used only on small open top vapor degreasers (especially with chlorofluorocarbon solvent), because energy consumption may be too great when used on larger open top vapor degreasers. These coils increase the portability of the open top vapor degreaser, because no plumbing is required for any tap water condenser coils.

In USEPA studies, tests on three below-freezing refrigerated freeboard chillers measured emission reductions of 16, 43, and 62%. The 16% reduction was on an older design; the units which achieved 43 and 62% reductions are considered more representative of present designs.

Chillers are not normally used on cold cleaners. While a chiller would certainly reduce emissions, especially from units using the more volatile solvents, this control is usually too expensive for a cold cleaner. A chiller would be about as effective as a normally closed cover, but it could cost considerably more, perhaps more than the cleaner itself. Still, some units with unusually high emission rates could find a chiller appropriate.

Carbon Can Capture

Carbon Adsorption: Carbon adsorption systems are used to capture emissions from solvent cleaning operations. For appropriate degreasing processes, these devices can achieve high levels of emission control. Equipment design and operation are fairly well standardized and described in detail in industry literature.

A well designed and maintained carbon adsorption system will normally capture more than 95% of the organic input to the bed. However, carbon adsorption systems for solvent cleaning normally achieve only 40-65%

reduction of the total solvent emission. One reason for the difference between the theoretical and actual reductions is that the ventilation apparatus of the control system does not capture all of the solvent vapors and deliver them to the adsorption bed.

Major Loss Areas

As previously discussed, **major loss areas are: drag-out on parts, leaks, spills, and disposal of waste solvent,** none of which are greatly affected by the ventilation system. Improved ventilation design can increase an adsorber's overall emission control efficiency. A higher ventilation *rate* alone, however, will not necessarily help, because increased turbulence caused by the collection systems could disrupt the air/vapor interface. The effectiveness of the ventilation system can also be improved through use of drying tunnels and other devices which decrease drag-out losses.

Improper operation decreases the control efficiency of carbon adsorption systems. Here are some examples:

- Dampers that no longer open and close properly,
- Use of carbon that does not meet specifications,
- Poor timing of the desorption cycle, and
- Excessive inlet flow rates.

Desorption cycles must be frequent enough to prevent breakthrough of the carbon beds, but not so frequent as to cause excessive energy waste. The degreaser's air/vapor interface may be disturbed as a result of excessive adsorber inlet flow, which can increase losses from low inlet collection efficiency. **Good operating practice** and **proper maintenance** can eliminate these problems.

Carbon adsorption systems can effect the highest achievable level of emission control for many degreasing operations. Its positive aspects are well known. There are, however, a few negative aspects that should be mentioned. First, where solvent mixtures are used, the collected solvent emissions will be richer in the more volatile components. Thus, the recovered solvent mixture is rarely identical to that used in the cleaning system.

Second, some solvent components are water soluble. Examples are acetone or ethyl alcohol, used as co-solvents with trichlorotrifluoroethane, and various stabilizers added to many solvents to inhibit decomposition. These water soluble components will be selectively extracted by the steam during the desorption process. In these cases, fresh solvent, stabilizers and/or co-solvents must be added to the recovered solvent before it is reused.

Tests performed on carbon adsorption systems controlling an open top vapor degreaser and a conveyorized non-boiling degreaser measured 60 and 65% emission reduction respectively. These levels of control are typical of properly designed, adjusted and maintained adsorption systems of degreasing operations which are suitable for this type of control.

Three other carbon adsorption systems were tested and found to have low control efficiencies. Two of these achieved 21% and 25% emission reductions. A third actually increased emissions by 8%. These tests emphasize the need for proper application, design, operation, and maintenance.

Safety Switches

Safety Switches: One type of control with broad applications for many degreasers is the **safety switch.** These devices can prevent huge emissions which could be caused by equipment malfunctions. Safety switches are used on vapor degreasers to prevent emissions during malfunctions and abnormal operation. The five main types of safety switches are:

- Vapor level control thermostat,
- Condenser water flow switch and thermostat,
- Sump thermostat,
- Solvent level control, and
- Spray safety switch.

The first four safety switches listed above turn off the sump heat while the fifth turns off the spray.

The most important safety switch is the vapor level control thermostat. This device is activated when the solvent vapor zone rises above the designed operating level. This can occur if the coolant flow is interrupted, for example. When the hot vapors are sensed, the sump heater is turned off, thus minimizing vapor escape. This thermostat should be a manual reset type for manually operated degreasers. For conveyorized degreasers, the vapor level control thermostat should activate an alarm system. These controls should be checked frequently.

Temperature Controls

The condenser water flow switch and thermostat turn off the sump heat when either the condenser water stops circulating or the condenser water becomes warmer than specified. If the condenser water flow switch and thermostat are properly adjusted, then they will serve as a backup for the safety vapor thermostat and also assure efficient operation of the condenser coils. In summer months, the cooling water for condensing coils often becomes too warm. In this case, the thermostats in a condenser water flow switch can signal a need for improvement, such as increasing the water flow rate. This problem occurred during a test performed for the EPA.

As oils, greases and other contaminants build up in the solvent, the boiling point of the mixture increases. Both the sump thermostat and solvent level control prevent the sump from becoming too hot. The sump thermostat turns off the heat when the temperature rises significantly above the solvent's boiling point. The solvent level control turns off the heat when the liquid level of the boiling sump falls to the heater coils. Without these controls, excessive heat could decompose the solvent, emitting such compounds as hydrochloric acid.

Safety Switches

The spray safety switch is not used as often as the other safety switches, but it can offer a significant benefit. Specifically, if the vapor level drops below a specified level, then the pump for the spray application will be cut off until the normal vapor level is resumed. Thus, the spray safety switch prevents spraying above the vapor level, thereby avoiding excessive emissions.

The effectiveness of the five safety switches cannot be quantified because their operation results from poor degreaser maintenance and use. Nevertheless, considering the fact that vapor degreasers do not always receive proper attention and maintenance, it is expected that the safety switches provide a significant reduction in emissions for typical vapor degreasing operations.

303.2 CARRY-OUT EMISSIONS

Conveyors Can Cause Emissions

Carry-out emissions result when clean parts still containing liquid or vapors are removed from the degreaser. Good operating practices are the primary *method* of reducing carry-out emissions. Furthermore, there are devices that can help minimize the carry-out from cold cleaners and conveyorized degreasers, but not generally from open top vapor degreasers.

The main control *device* for carry-out emissions from cold cleaners is a simple drainage facility. The two types of drainage facilities are the external and internal drainage racks (or shelves). The *external* drainage rack is attached to the side of the cold cleaner at the top. The liquid solvent from the cleaned parts drains into a trough and is returned to the cold cleaning bath. This control is inexpensive and easily retrofitted.

An *internal* drainage facility is located beneath the cover. It may be a basket that is suspended over the solvent bath, or a shelf from which the solvent drains. Particularly with solvents which are more volatile than mineral spirits, an internal drainage facility can prevent significant solvent emissions. Sometimes it cannot be reasonably retrofitted, because there may not be enough room inside the cleaner to drain parts while cleaning other parts.

Drying Tunnels

The main control devices for carry-out emissions from conveyorized degreasers are drying tunnels and rotating baskets. A drying tunnel is simply an extension from the exit of the conveyorized degreaser. This tunnel extension gives cleaned parts more time to dry completely. The drying tunnel should work particularly well in combination with carbon adsorption. Drying tunnels can be retrofitted, if there is adequate space.

Rotating Baskets

Rotating baskets may be used on cross-rod degreasers and ferris wheel degreasers. This perforated cylinder, containing parts to be cleaned, is slowly rotated in the cleaning system, so that the parts cannot trap liquid solvent. Rotating baskets are integrally designed into the conveyorized system, so they are not easily retrofitted.

Conveyors *themselves* can cause carry-out emissions. Some designs cause less emissions than others. In general, these emissions are directly proportional to the surface area entering and leaving the cleaning zone. One design uses small pushers to move parts along fixed rods which support the work. This design is advertised to carry out 70% less solvent than conventional wire mesh conveyors.

The effectiveness of control devices that help minimize carry-out emissions cannot be quantified, because the amount of carry-out depends so much on the type of work loads, shapes, crevices, and the quality of operation. Nevertheless, it is obvious that, if the exiting clean parts have visible liquid solvent, then carry-out emissions will be substantial.

400 INSPECTIONS

How to do an Inspection. This chapter, written primarily for the regulatory inspector, can be a source of information for conducting facility self-inspections. It can guide you through a complete compliance inspection of a solvent facility. It discusses procedures for pre-inspection, post inspection, sampling, and inspector safety. Guidelines and checklist materials are provided here. **When you use your checklists**, you may find rewards: Your inspections will be more effective, and **you will save time** as you are more aware of these aspects of your inspection:

How
to
Do It

- What to look for,
- What questions to ask,
- How to locate unpermitted solvent equipment, and
- How to conduct, complete, and document your inspection.

The standards and policies you need to determine compliance with each requirement will depend on *your* specific *district* rule and implementation strategy. You may place a copy of your district rule and your inspection aids in the appendix provided for it. The index can help you find the section and page number for additional information on specific issues.

First, follow the pre-inspection procedures. Review the source files and applicable rules, learn what equipment you may need, what information to exchange with the facility manager, and what to check for on the Permit to Operate.

Then, proceed with a complete compliance inspection, including solvent equipment, operations, and administrative requirements.

Finally, the post-inspection procedures provide guidance on how to determine compliance rates, calculate excess emissions, and assure follow-up.

401 PRE-INSPECTION PROCEDURES

Be
Prepared

The objective of an inspection is to determine a facility's compliance with district regulations and Permits to Operate. It is essential to prepare for the inspection prior to visiting the site. Here are some guidelines, listing steps to follow prior to the inspection.

400 INSPECTIONS

401.1 FILE REVIEW

Review Your Files

Before the site inspection, review all information available in the district source files including:

1. Processes involved at the facility,
2. Source tests and emissions inventory,
3. Alternative emissions control plans,
4. Equipment lists,
5. Permit applications,
6. Permits approved,
7. Conditions for each permitted unit,
8. Previous inspection reports,
9. Reports of violations (note rule sections and equipment),
10. Enforcement action taken,
11. Complaints,
12. Variance history,
13. Abatement orders, and
14. Breakdown reports.

401.2 REGULATION REVIEW

Review any references to specific rules which are noted in the source files. Study and understand each standard and exemption in pertinent rules, bearing in mind that you may be asked to explain them. To clear up any confusion, discuss the requirements with experienced personnel to assure that there is a consistent interpretation of these requirements and how they are to be applied.

401.3 INSPECTION FORM

Since most district solvent rules specify their own requirements for operations, equipment, and administration, you will want to use *your district's* inspection form. In designing an inspection form, it is helpful to solicit a response for each requirement and exemption, and you may wish to limit the length of the form to one page, using both sides. Examples are included in Appendix B.

To save time during the pre-inspection meeting, you may wish to complete some portions of the inspection document before the inspection.

401.4 EQUIPMENT CHECK

Assemble all the appropriate equipment to conduct your inspection. Consider the items you *may* need in order to protect yourself, to determine compliance, to calculate excess emissions, and to complete the inspection efficiently. Here are some of the items you may need:

Take it With You

1. Vision and hearing protection, safety shoes, hard hat, and gloves,
2. Identification cards and business cards,
3. Forms for inspection and chain of custody
4. Sampling supplies, if samples may be required: cans, labels, pens, seals, wipes, and container to carry cans
5. Specialized equipment such as a visible emissions evaluation kit, with provisions for determining temperature, dewpoint, and wind, and
6. Tape measure, camera and film.

Inspection & Safety Equipment

401.5 PRE-ENTRY AND ENTRY

1. Upon arrival at the facility, smell the air and take an overall view:

    - Do you smell any solvent vapors or other odors outside or inside?
    - Do you see any emissions?
    - Note the size and layout of the facility.
    - Identify and prioritize potential problem areas to inspect first, in case your time runs short.

2. Enter the facility through the normal public access.
3. Present your business credentials.
4. Request to see the contact person mentioned in the files, such as the president or a supervisor of environment, production, or maintenance.

Be prepared to cite and provide copies of these sections of the California Health & Safety Code (HSC) in case the source representative may not be familiar with your district's authority:

- 41510: Right of Entry
- 42303: Information Required

Refused Entry

Know your district's policy for **refused entry**.

401.6 PRE-INSPECTION MEETING

Before you begin your inspection, meet with the source operator, manager, or their representative to discuss the details which *either* of you may need to know before you conduct your inspection.

Talk With Your Host

1. **Introduce** yourself to the manager. This would be a good time to exchange business cards.
    - Tell the manager that you intend to conduct a compliance inspection of the solvent cleaning equipment at the facility.
    - Discuss any unfinished district business, such as variances, Authority to Construct, and any prior compliance problems.
    - Tell the manager that you will need some assistance from him or her concerning the inspection and that you will brief him / her on your findings when the inspection is complete.
    - Obtain facility information, including:
        - ♦ Name and ownership of the facility
        - ♦ Address of the facility
        - ♦ Name and title of the contact person
        - ♦ Phone number with area code
    - Record the date and time of the inspection.
    - Discuss sample collection if appropriate, and request copies you need, such as inventory reports or material safety data sheets (MSDS).
    - Discuss safety procedures.

Pre-Inspection Procedures

2. Review your district records with the facility manager to reconcile the number, type, and location of solvent equipment at the facility. Obtain current operating information about each one, and if any equipment is reported to be in storage, then make a note to assure, during the inspection, that it is in fact inoperative.

3. Be sure to specifically ask the facility manager about any *small cold cleaners*. Some facility managers may not be aware that these types of cleaners may be subject to solvent rules.

Pre-Inspection Procedures

4. Review the facility solvent usage records for each degreaser in operation. This information will be useful to your emissions inventory efforts, and could be used in an alternative method for determining excess emissions. Be sure to record the **exact type of solvent** used in each degreaser.

402 FACILITY INSPECTION PROCEDURES

Begin the Inspection

Begin the facility inspection, observing these **six points of inspection:**

- Capture / Point of Contaminant Generation
- Transport
- Air Mover
- Instrumentation
- Subsystem
- Control Device

Ask yourself questions about each aspect of the facility which will help you to determine compliance with your district's regulations and permit conditions. Most districts have developed inspection forms tailored for their own regulations and permit conditions. Write the answers on the form.

If your district does not have a tailored inspection form, the questions in the following sections may help you to develop a source specific inspection form pertinent to the regulations and permit conditions for facilities in *your* district. A sample inspection checklist is included in Appendix B.

Compliance with Regulations. Check compliance with the regulations associated with solvent facilities, including the requirements for **toxics.**

Begin the inspection by checking the Permits to Operate for each permitted item. Verify that the equipment operates in accordance with the permit conditions and district regulations. Most district regulations also include emission reduction requirements, solvent storage and disposal requirements, facility exemptions, and recordkeeping; consider all of these aspects.

400 INSPECTIONS

A current Permit to Operate must be posted on or near the equipment. Determine whether the equipment has been altered since the Permit was last issued. If the equipment has been modified, check to see that an Authority to Construct was granted. A Notice of Violation is appropriate if the permit procedures were not followed or if the source is not in compliance with district permit conditions. **Many districts also require operating practices to be posted.**

The following inspection procedures apply to specific types of solvent cleaning machines.

402.1 COLD CLEANERS

1. Equipment Requirements:

a. Is the container sound and free of leaks?

b. Does the cover prevent solvent evaporation? If the cold cleaner has a *remote* reservoir, check your rule to see if it requires a cover.

c. Does the cleaner have a method or facility for draining cleaned parts?

d. Compute the freeboard ratio (see Figure 400.1). If the degreaser uses a water cover, assure that the solvent is water-insoluble and heavier than water. For alternative control methods, check district documentation.

2. Operating Requirements:

a. Is the degreaser operated and maintained in proper working order?

b. Are there are any leaks from the degreaser *during* operation?

c. Check the solvent storage, including waste solvent, to be sure all containers are closed.

d. If the facility distills waste solvent, take a sample.

e. Are the covers closed when the degreaser is not in use?

f. Assure that any "spray" equipment causes a *steady flow* of liquid, rather than an atomized or shower type of spray. No splashing is allowed.

$$\text{Freeboard Ratio} = \frac{\text{Height}}{\text{Width}}$$

$$\text{FR} \geqq 0.75$$

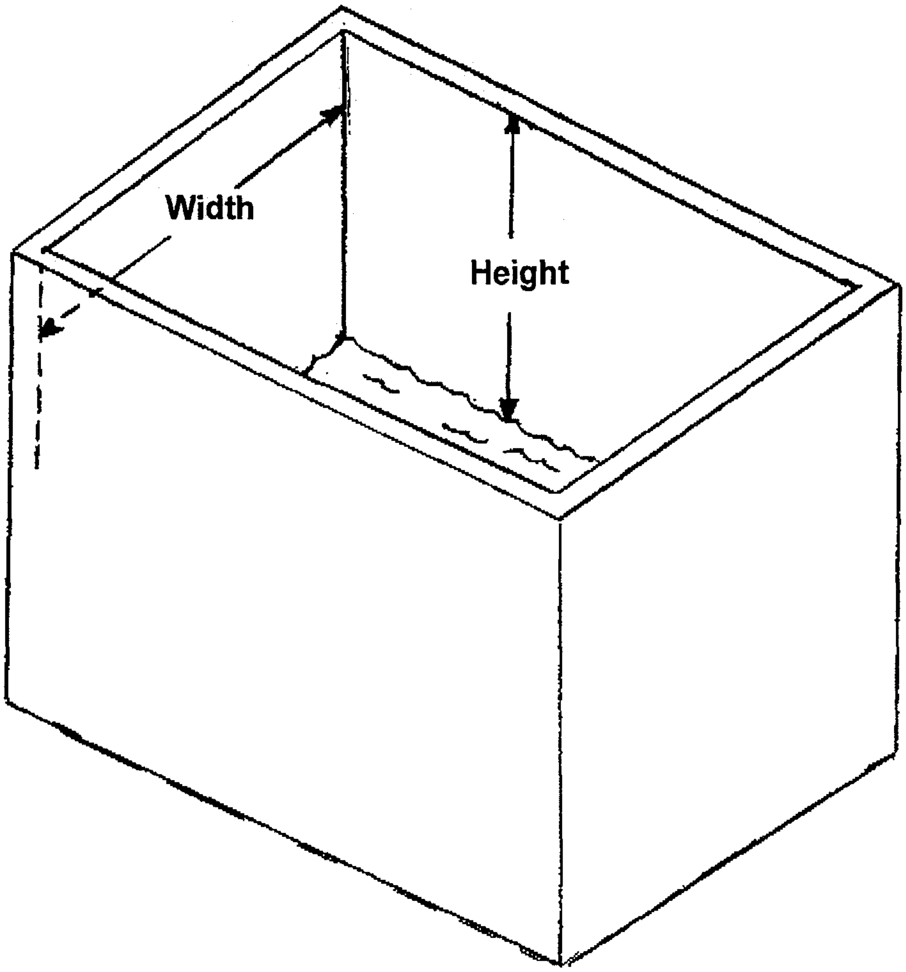


Figure 400.1 Cold Degreaser Freeboard Ratio

g. Assure that any agitation is done by a mixer, recirculation, or ultrasonics. No air agitation is allowed.

h. Assure that parts are allowed to drain until dripping stops.

i. Check for porous and absorbent material in the degreaser.

j. If a hoist is used, check its speed. One method is to lower the hoist hook to the floor, measure up 5.5 feet and use a stop watch to time the hook's upward retrieval. If the hook is below the 5.5 foot mark after 30 seconds, then the speed is OK.

402.2 VAPOR DEGREASERS

1. **Equipment Requirements:**

a. Is the container sound and free of leaks?

b. Does the cover prevent solvent evaporation?

c. Does the cleaner have a method or facility for draining cleaned parts?

d. Measure the freeboard ratio. (See Figure 400.2.)

e. If a control device is used, check for district documentation and permit conditions.

f. Are all required safety switches installed? The machine may have remote reservoirs for emptying and refilling as depicted by Figure 400.3. Assure that the facility and district have established a schedule for testing the overflow shutoff controls and other safety switches. The facility is to provide these inspection records.

2. **Operating Requirements:**

a. Is the degreaser operated and maintained in proper working order?

b. Are there are any leaks from the degreaser *during* operation?

c. Check the solvent storage, including waste solvent, to be sure all containers are closed.

d. If the facility distills waste solvent, take a sample.

e. Assure that covers are closed when the degreaser is not in use.

f. Assure that any solvent sprays result in a steady liquid stream. No atomized or shower type sprays are allowed. No splashing is allowed.

g. Check to see that agitation is done by a mixer, recirculation, or with ultrasonics. No air agitation is normally allowed.

h. Assure that parts are racked in the degreaser to allow maximum drainage.

i. Check for any porous and absorbent material in the degreaser.

j. If a hoist is used, check the hoist speed. An easy way to check hoist speed is to lower the hook of the hoist to the floor, measure up 5.5 feet and use a stop watch to clock 30 seconds. If the hoist hook is below the 5.5 foot mark after the 30 seconds the hoist speed is OK.

k. Assure that parts are degreased in the vapor zone until condensation stops.

l. Look for pools of solvent on the parts. All pools must be tipped out if the parts are manually loaded.

m. Assure all parts appear dry before they are removed from the degreaser.

n. Look for water in the solvent returning from the water separator.

o. If a lip exhaust is used, it must be turned off when the degreaser is covered.

p. Assure that no fans or room drafts disrupt the vapor zone.

$$\text{Freeboard Ratio} = \frac{H}{W}$$

$$FR \geqq 0.75$$

W = the least ***inner*** width across the top rim of the enclosure, and

H = the distance from **top of *vapor* to top of rim,**

or

the distance from **top of *liquid* to top of rim**, whichever is less.

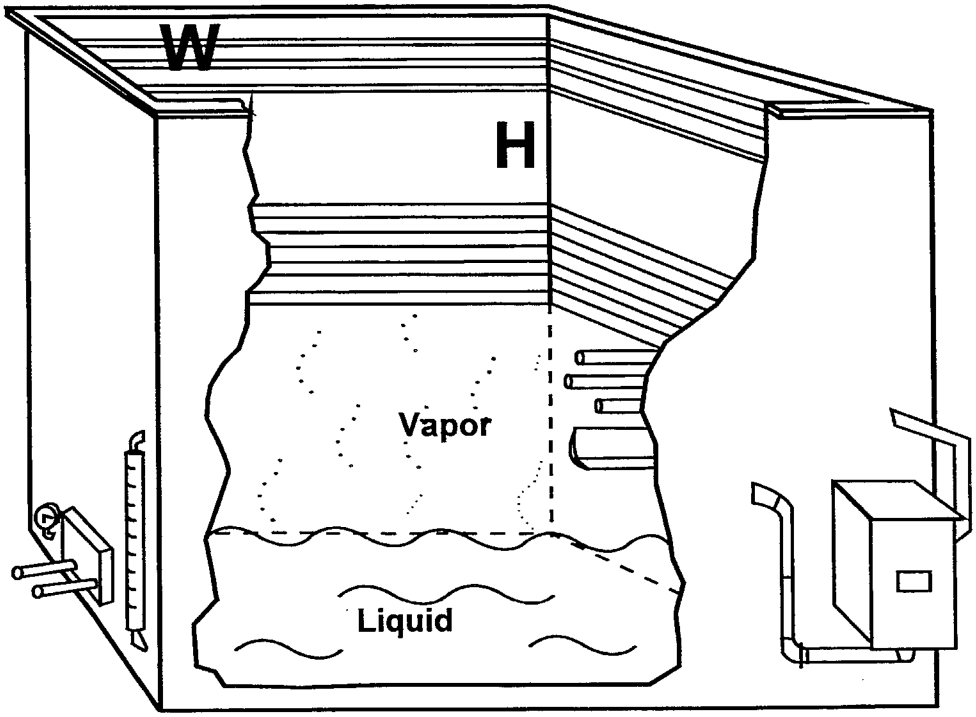


Figure 400.2 Vapor Degreaser Freeboard Ratio

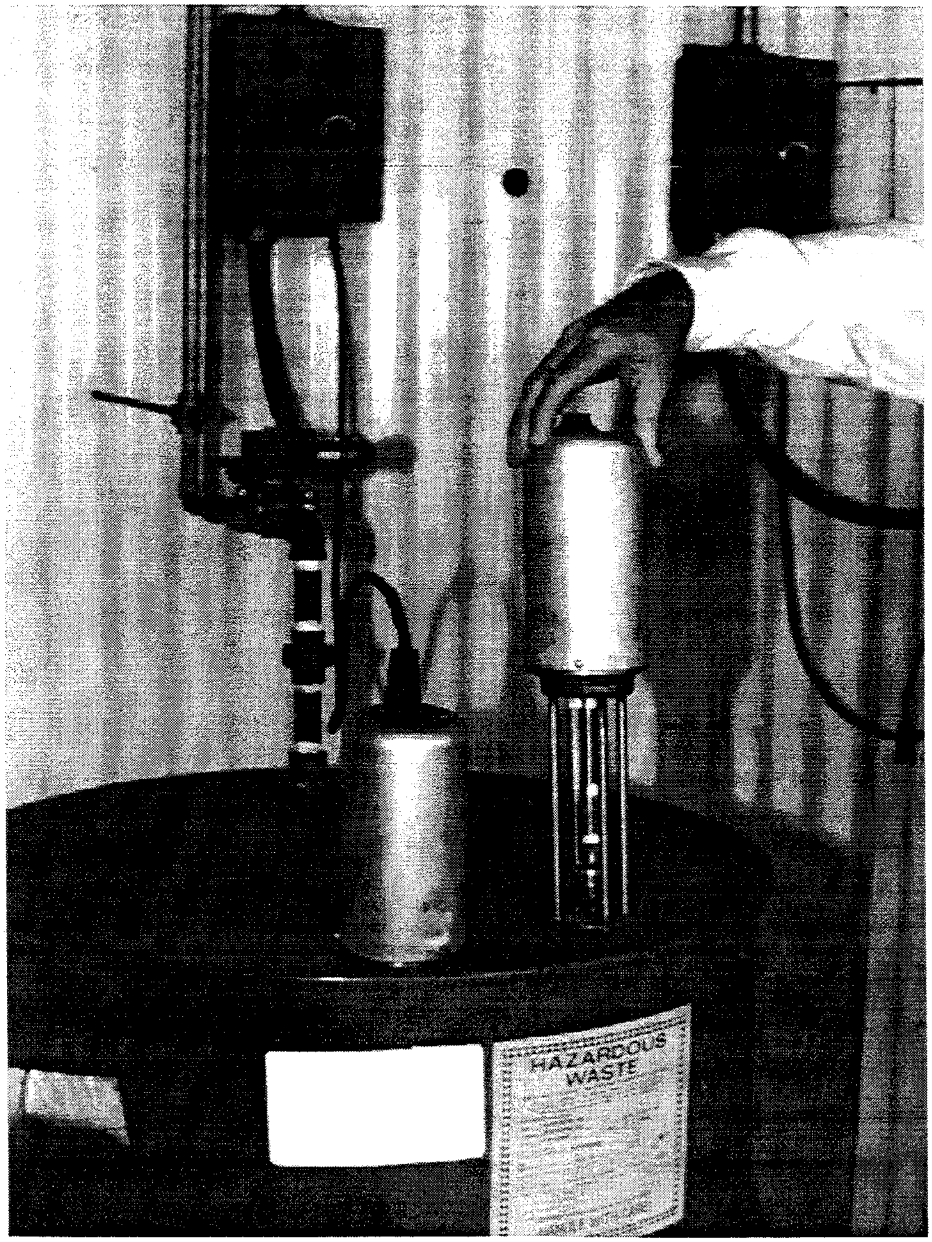


Figure 400.3 Waste Reservoir With Overflow Shutoff Control

402.3 CONVEYORIZED DEGREASERS

1. **Equipment Requirements:**
   a. See the cold or vapor degreaser requirements in this section.
   b. Assure that the unit is fitted with a hood or enclosure to reduce emissions.
   c. Look for the drying tunnel, rotating basket, or tumbler. See your district rule for specific requirements.
   d. Check to see that all entrances and exits are silhouetted.
2. **Operating Requirements:** See cold or vapor degreasers in this section.

402.4 SOLVENT WASTE HANDLING

Solvent wastes contain at least trace amounts of the soiled materials they have cleaned, possibly including toxic agents. (See Chapter 6, Toxics.) Classified as hazardous waste, spent solvent is subject to handling requirements including storing, manifesting, and transporting, and labeling, as depicted in Figures 400.3 and 400.4. Storage is usually limited to 90 days.

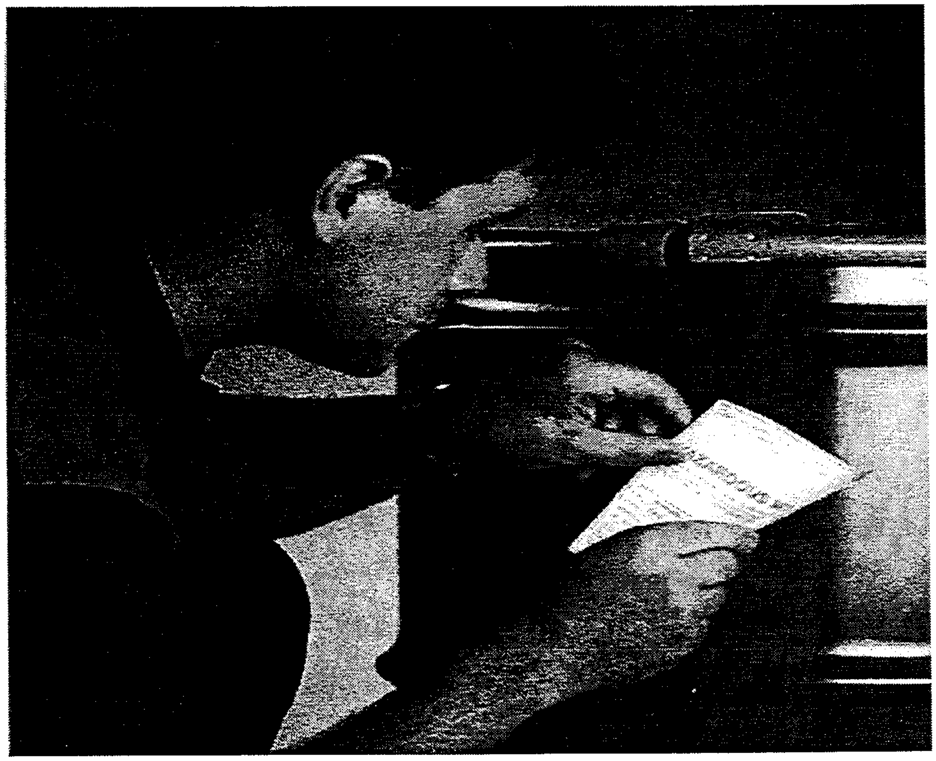


Figure 400.4 Waste Solvent Must Be Properly Labeled.

403 POST- INSPECTION PROCEDURES

Do not conclude the inspection until you have obtained all the information needed to make a compliance determination, calculate excess emissions, and document violations, unless other arrangements are made or you have been asked to leave. If you are asked to leave, follow your district policy.

Once all the information has been gathered, confer with the facility manager on your findings. Make your compliance determinations, calculate excess emissions, and issue all necessary violation notices, warnings, compliments, etc. Follow up all violations in accordance with your district policy to assure that the source is brought into compliance.

404 SAMPLING TECHNIQUES

Normally no samples are necessary to determine compliance with the solvent cleaning rules. However, in those cases where you need to determine the exact solvent used, the vapor pressure of the solvent, or the percent solvent in distilled waste, samples may be necessary.

It is very important that your samples are collected and preserved in accordance with acceptable procedures. ASTM Method D4057-81, Manual Sampling of Petroleum and Petroleum Products, specifies many sampling techniques. It can help you assure that your samples are admissible evidence.

It is important that you use the proper techniques for the sampling application. We suggest that your district take the time to adopt sampling techniques for solvent cleaning operations based on these acceptable procedures. Your district techniques should address the sampling container, sampling method, and preservation of the samples.

405 LABORATORY TEST METHODS

Solvent properties are usually known based on suppliers' specifications and/or handbook data. The identity of many solvents is fairly evident from characteristic odors, appearance, or other properties such as density, which can be checked in the field with a hydrometer. Samples are usually taken and analyzed only as a routine check performed at intervals, or else to verify and document a suspected violation based on some other evidence.

Laboratory test methods are usually specified in applicable district rules, and the laboratory methods used to analyze any sample should conform to such specifications. If test methods are not specified in an applicable rule, appropriate standard test methods from ASTM, EPA or ARB may be used.

One of these test methods, ASTM E-260, "Practice for Packed Column Gas Chromatography," is frequently specified for determining the composition of solvent mixtures. This analysis can be used to calculate the vapor pressure of the material if permitted by applicable rules.

Another test method uses a self-contained apparatus called an *isoteniscope*. ASTM D2879, "Test Method for Vapor Pressure - Temperature Relationship and Initial Decomposition Temperature of Liquids by Isoteniscope," is often specified for direct measurement of vapor pressure. However, such measurements may need to be corrected for the presence of water and organic compounds defined as exempt by applicable regulations.

For quantifying VOC in solvent recovery residues, ARB Method 401, "Determination of the Weight Percent of Volatile Organic Compounds in Waste Products," is frequently specified. It uses gas chromatography in a gravitational purge and trap method.

Operators and district personnel should be familiar with regulatory requirements applicable to the aspects of operation which may be measured by laboratory analyses, and industry operators should be able to control their practice and the materials they use to routinely achieve compliance. A good understanding of regulations and good control of operations will make bad news from lab testing both infrequent and unlikely.

Why would you want to determine the percent solvent/VOC? Here is an example: 1,1,1 trichloroethane, or "trike," is currently an exempt compound. It is usually mixed with stabilizers which contain VOC. However, some districts may intend to disallow the use of exempt trike by placing a limit of 5% or 10% on the ***total*** VOC content of a cleaning agent.

When you submit your samples to the laboratory, clearly specify to the lab technician what tests are needed and in what units the results should be expressed. The Technical Review Group (TRG), comprised of representatives from local APCDs, the ARB, and the USEPA, may recommend standardized test methods for low vapor pressure solvents and solvent residues.

500 LEGAL REQUIREMENTS

What's in This Chapter ?

In this chapter we address air quality legal requirements for solvents, **beginning with district requirements and ending with pertinent verbatim sections of the California Health and Safety Code (HSC).** (Other environmental regulations also apply to noise, water, and hazardous materials, but they are not the *main* focus of this manual.)

INTRODUCTION

The California Legislature passes laws, called statutes, that authorize Executive Branch agencies such as the Air Resources Board (ARB) to implement these statutes by adopting and enforcing regulations. The ARB directly regulates air pollutant emissions from motor vehicles and some other sources. However, most industrial emission sources are regulated principally by the **Air Pollution Control Districts.** Solvents are also regulated by the Department of Toxic Substances Control (DTSC).

501 DISTRICT REQUIREMENTS

Each local district within the state, usually called an Air Quality Management District (**AQMD**) or Air Pollution Control District, (**APCD**) has its own legal requirements based on its own special needs. These requirements vary from one district to another due to the air quality and source types within the districts.

To assure compliance, the inspector is to collect and apply the rules for his or her local district. Appendix C of this manual contains samples and extractions from district solvent rules, and Appendix H is provided as a collection place for you to put the rules for *your* district. All districts have requirements in the following areas, each of which is discussed here, some in detail:

All Districts Regulate . . .

- Authority to Construct (including modifications)
- Permit to Operate
- Visible Emissions
- Particulate Matter Emissions
- Fugitive Dust Emissions
- Nuisances
- Breakdown and Variances

500 LEGAL REQUIREMENTS

501.1 AUTHORITY TO CONSTRUCT AND PERMIT TO OPERATE

The districts use these two documents to permit the construction and operation of facilities and equipment which could cause air pollutant emissions. These documents also specify conditions for the construction and operation.

Specified Conditions for Permits to Operate. Under the authority of the California Health and Safety Code (HSC), and in order to comply with the California State Implementation Plan where applicable, the districts may issue conditions, other than the applicable general emissions limitations, for the operation of equipment and components of facilities. These conditions are stated in the Permit to Operate (PO), and often include such items as these: operating hours, throughput, materials type and quantity, and emissions limits.

Maintenance Program

Maintenance Program. The Permit to Operate stipulates that the equipment must be properly maintained and kept in good operating condition. The facility manager may also be directed to develop a maintenance program for the equipment listed in the Permit in order to preclude a violation of the California Health and Safety Code and applicable district rules and regulations.

Monitoring and Recordkeeping. Documentation of key operating parameters may be required in some Permits to Operate. The records may take the form of handwritten logbooks, completed preprinted forms, strip or circular recording charts from continuous recording readouts, or a computerized database. Computer records may do more than merely archive monitored operating parameters; they may also help to analyze problems.

Rule Violations. In the event that any equipment violates district rules and regulations, many districts require the facility manager to stop operating the pertinent equipment and proceed as necessary to end the violation. The facility manager must notify the district of any upset conditions, breakdown or scheduled maintenance which causes emissions in excess of limits established by the district. A variance allowing a facility to temporarily pollute while it works towards compliance may be allowed by the local district hearing board if legal requirements are met.

Facility Inspection. The facility owner may be required to submit a periodic inspection report. The report may include the amount of emissions produced, operating conditions, calibration of monitoring instruments, and whether or not the operating conditions complied with the Permit to Operate or were within the manufacturer's specifications. Data from the report can be used for the emissions inventory and to validate the accuracy of monitoring records.

Logs

Maintenance Logs. Permit conditions may require records of maintenance performed, including the time, date, types of problems and their resolutions, and the names of persons doing the work. These records must be retained for specified periods of time, typically three years, and they must be made available to the air pollution control district upon request.

Manuals

Manuals for Operation and Maintenance. Some Permits require operators to obtain and be familiar with an Operations and Maintenance Manual (O&M) prepared specifically for their facility. The manufacturer may have prepared most of this information. These manuals typically include:

1. General information about the facility design and equipment.
2. Plans describing procedures and operating parameters.
3. Plans describing preventive maintenance schedules, inspection and repair programs, and the recommended spare parts inventory.
4. Emergency procedures for fires, gas leaks, power losses, waste spills, etc.
5. MSDS information

Many permits require that the equipment be operated in accordance with manufacturer's instructions, unless the instructions conflict with district rules or permit conditions. The manufacturer instructions and procedures, along with the Operating Permit, typically must be posted on the control panel or other equipment, and be readily visible or available to the operator.

501.2 VISIBLE EMISSIONS (VE)

Each of the air pollution control districts in California has a visible emissions limitation rule. Although the texts of these rules vary, they provide that:

"... no person shall discharge into the atmosphere from any source whatsoever any contaminant, other than uncombined water vapor, for a period or periods aggregating more than three minutes in any one hour which is:

(a) As dark or darker in shade as that designated as No. 1 (or 20% opacity) on the Ringelmann Chart, as published by the United States Bureau of Mines, [Some districts use Ringelmann No. 2 or 40% opacity.]

(b) Or of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subdivision (a)."

500 LEGAL REQUIREMENTS

The State standard for visible emissions (Section 41701, California Health and Safety Code) **is No. 2** on the Ringelmann Chart, or 40% opacity.

Ringelmann System

The Ringelmann system is used to determine whether emissions of smoke are within the limits or standards which are set by statutes and ordinances and defined by the Ringelmann Chart. In this system, smoke density in a plume is compared with a series of graduated shades of gray, as judged by the inspector. EPA Reference Method 9, in Appendix G of this manual, describes in detail how to perform visible emission evaluations and how to become certified to do so.

The Compliance Division of the ARB conducts a "Fundamentals of Enforcement" class four times a year to train and certify government and industry personnel to perform these evaluations. The certification is valid for a period of six months, after which recertification is available.

VE Calculations

Calculating the results of visible emissions evaluations: For HSC applications, the inspector collects groups of all the 15-second intervals for which the opacity was observed to exceed the Ringelmann limit. Then, every group of over **three minutes** in a one hour period constitutes a violation. By contrast, for federal applications of Method 9 (NSPS applications), opacity is determined as an **average** of 24 consecutive readings at 15-second intervals **(six minutes)**.

501.3 PARTICULATE MATTER EMISSION LIMITS

Air pollution control districts have general rules which apply to any source operation which emits or may emit dust, fumes, or suspended particulate matter. Some rules specify limits by concentration, in grains per cubic foot, for example; other rules specify weight of emissions per unit of production. Most districts have both limits. To determine the concentrations of particulate emissions at facilities, most districts use ARB Method 5, contained in Appendix C. EPA Method 9 is very similar and can also be used.

501.4 FUGITIVE DUST EMISSIONS

Dust

Fugitive dust regulations prevent or limit the amount of dust which could escape into the ambient air. In most solvent facilities, dust is not ordinarily a problem, but without controls it could emanate from some locations, e. g., at the points of supply or storage.

501.5 NUISANCE

District rules based on Section 41700, HSC, protect the public's health and welfare from the discharge of air contaminants which constitute a public nuisance. This concept includes protection from injury, detriment, and annoyances such as odors from emissions.

Odors

501.6 EQUIPMENT BREAKDOWN PROVISIONS

Each district has an equipment breakdown rule for reasonable malfunctions. For stated conditions, the rule gives some protection from enforcement actions when certain equipment fails and prevents compliance with air pollution regulations. Industrial managers may want to keep a copy of the breakdown rule at the work site and assure that personnel know their responsibilities in the event of an equipment malfunction.

In order to qualify for district breakdown provisions, a malfunction must meet conditions specified by the district. These conditions are **typical:**

1. The breakdown is a result of a failure that was unforeseeable,
2. The breakdown is not the result of neglect or disregard of any air pollution control law, rule, or regulation,
3. It is not intentional or the result of negligence,
4. It is not the result of improper maintenance,
5. It does not constitute a nuisance, and
6. It is not an abnormally chronic breakdown of the same equipment.

District rules also list a number of procedures which must be followed in reporting the breakdown in a timely manner to the district. If the breakdown is not reported to the district within the allowed time period, as stated in the rule, a separate violation occurs, for which enforcement action is appropriate.

500 LEGAL REQUIREMENTS

Breakdown Log

When a breakdown is reported to the district it is recorded in the district's breakdown log. Sources must provide the district with this information:

1. The source's name and location and the source contact's name and telephone number,
2. The specific equipment affected by the breakdown,
3. The specific equipment that failed,
4. The date and time that the breakdown occurred,
5. The date and time that the breakdown is being reported to the district, and
6. The remedy proposed by the source.

Upon receipt of a breakdown report, the district performs an on-site investigation of the malfunctioning equipment to determine whether it meets the prescribed breakdown conditions. If the inspector determines that a valid breakdown condition does not exist, he or she may initiate enforcement action. This could lead to fines, abatement orders, and injunctions against further operations.

Filing a breakdown report which is false, or claiming that a malfunction is a breakdown, may constitute a violation. The burden of proof is on the source to provide sufficient information to show that a breakdown did occur. Otherwise, the source is subject to appropriate enforcement action.

A source with a breakdown must take immediate steps to correct the malfunction as quickly as possible. If a source finds that repairs cannot be completed within the district's allowable duration for a breakdown, the source may file for an emergency variance in order to avoid enforcement action. (The allowable duration is usually 24 hours for continuous processes which cannot be shut down immediately, but all other equipment may be operated only to the end of the cycle.)

After a breakdown has been repaired, and within a specified time limit, district rules require sources to **submit written details** to the air pollution control officer:

Report Breakdown Repair

1. Proof of the source's return to compliance, including the date and time that the breakdown was corrected,
2. The duration of excessive emissions,
3. An estimate of the quantity of excess emissions,
4. A statement of the cause of the occurrence, and
5. The corrective measures to be taken to prevent recurrences.

The district log will also include the following information, some of which may be entered as the case progresses:

1. A confirmation that the breakdown is allowable under district rules,
2. The name of the district investigator,
3. The initial inspection file number,
4. The compliance confirmation inspection file number,
5. The date that the breakdown correction report was filed by the source, and
6. An indication of whether or not a variance was requested.

501.7 VARIANCES

A facility operator may petition for a variance in either of these situations:

Situations for Variance

1. Pollution control equipment has broken down and meets the criteria for breakdown condition under district rules, but the operator finds that it will take longer to repair the breakdown than provided for under the district breakdown rule. In such a case, the operator may wish to apply for an **emergency variance**. If good cause is shown, applications for emergency variances may be approved quickly: the chairman of a district hearing board or any *designated member* may issue an emergency variance without a notice and hearing.

2. A source ***is*** out of compliance, either by its own determination or by that of other inspectors, or ***expects*** to soon be out of compliance with any air pollution control district rule or regulation, or with Section 41701 of the HSC.

In either of these two situations the operator may want to apply for a variance in an attempt to obtain a shield from enforcement action during the temporary period of noncompliance. The decision and the impetus to file for a variance belongs to the source operator.

An application for either a **short variance** (90 days maximum) or a **regular variance** (1 year maximum, unless a schedule for progress is included) also asks for an **interim variance** (up to 90 days or until the next Hearing Board meeting, whichever comes first). It is the source's responsibility to estimate the length of variance needed and to apply for the appropriate one.

The **approval authority** for variances is the district Hearing Board rather than the air pollution control officer or his or her staff. A favorable decision is usually more likely if the source provides ample information in the application.

Although each district has its own rules for variances, the district rules are based on the HSC. Some of the pertinent sections are included at the end of this chapter. It would be helpful for district inspectors as well as source operators to be familiar with the local district variance requirements.

The law (HSC) says that:

Each Day of Violation is a Separate Offense

1. Sources are not allowed to operate in violation of ARB or district requirements without a variance, even if the source is working towards a solution to the problem. Under HSC Section 42400.2, if a source continues to operate in violation of district rules, it may be subject to a fine of $25,000 per day, or up to one year in the county jail, or both. Under HSC Section 42400.3, for *willful and intentional* violations, the penalty can be $50,000 per day, or up to one year in the county jail, or both.

(In general, penalties specified for **criminal offenses may include jail time**, and penalties for civil offenses do not. Also, fines can be imposed as separate offenses for each day of violation. Please consult the Health and Safety Code.)

2. A variance will not be granted unless the Hearing Board makes all of the findings listed in HSC, Section 42352.

Verbatim sections of the Health and Safety Code begin on the next page.

502 CALIFORNIA HEALTH AND SAFETY CODE (HSC) Summary Listing

The following sections of the California Health And Safety Code have been selected for verbatim presentation here, after this list. **These HSC sections are the basis for air pollution control laws, including the authority of districts** to adopt and enforce regulations, to perform inspections, and to issue permits with conditions. For specific situations, you may wish to consult the complete HSC.

HSC Sections Summary Listing

39000	Legislative Findings - Environment
39001	Legislative Findings - Agency Coordination
39002	Local and State Agency Responsibilities
39003	ARB Responsibilities
40000	Local / State Responsibilities
40001	Adoption and Enforcement of Rules and Regulations
40702	Adoption of Rules and Regulations
41509	No Limitation on Power to Abate Nuisance
41510	Right of Entry With Inspection Warrant
41700	No Person Shall Discharge Pollutants
41701	Opacity Standards - No Emissions Shall Exceed Ringelmann 2 . . .
42300	District Permit System
42301	Permit Issuance - Requirements
42301.6	Permit Approval: Powers and Duties of Air Pollution Control Officer
42301.7	Air Contaminants, Threatened Release
42303	Information Disclosure - Air Contaminant Discharge
42303.5	False Statements in Permit Applications
42304	Permit Suspension (Failure to Supply Information)
42352	Variance - Findings Required for Issuance
42400	Penalties, Criminal - Misdemeanor, $1,000/Day and/or Six Months Jail
42400.1	Penalties, Criminal - Negligence, $15,000/Day and/or Nine Months Jail
42400.2	Penalties, Criminal - Knowingly, $25,000/Day and/or One Year Jail
42400.3	Penalties, Criminal - Willfully . . . $50,000/Day and/or One Year Jail
42401	Penalties, Civil - Violating Order of Abatement $25,000/Day
42402	Penalties, Civil - Violations . . . $1,000/Day
42402.1	Penalties, Civil - Negligence, $15,000/Day
42402.2	Penalties, Civil - Knowingly, $25,000/Day
42402.3	Penalties, Civil - Willfully . . . $50,000/Day
42402.5	Penalties, Civil - Administrative, $500/Each Violation
42403	Penalties, Civil - Relevant Circumstances
42404.5	Statute of Limitations for Civil Actions
42450	Orders of Abatement, District Board: Authority, Notice, Hearing

503 INTRODUCTION, CA HEALTH AND SAFETY CODE

The California Legislature passes laws, called statutes, that authorize Executive branch agencies (such as the Air Resources Board) to implement laws, through regulations, pursuant to the directives of the statutes.

HSC Sections in Numerical Order

The following relevant California HSC references are included verbatim to provide you with the basis for California Air Pollution Control Laws. **The paragraph numbers are the HSC Section numbers in numerical order:**

39000 LEGISLATIVE FINDINGS - ENVIRONMENT

The Legislature finds and declares that the people of the State of California have a primary interest in the quality of the physical environment in which they live, and that this physical environment is being degraded by the waste and refuse of civilization polluting the atmosphere, thereby creating a situation which is detrimental to the health, safety, welfare, and sense of well-being of the people of California.

39001 LEGISLATIVE FINDINGS - AGENCY COORDINATION

The Legislature, therefore, declares that this public interest shall be safeguarded by an intensive, coordinated state, regional, and local effort to protect and enhance the ambient air quality of the state. Since air pollution knows no political boundaries, the Legislature declares that a regional approach to the problem should be encouraged whenever possible and, to this end, the state is divided into air basins. The state should provide incentives for such regional strategies, respecting, when necessary, existing political boundaries.

39002 LOCAL AND STATE AGENCY RESPONSIBILITIES

Local and regional authorities have the primary responsibility for control of air pollution from all sources other than vehicular sources. The control of vehicular sources, except as otherwise provided in this division, shall be the responsibility of the State Air Resources Board. Except as otherwise provided in this division, including, but not limited to, Sections 41809, 41810, and 41904, local and regional authorities may establish stricter standards than those set by law or by the state board for nonvehicular sources. However, the state board shall, after holding public hearings as required in this division, undertake control activities in any area wherein it determines that the local or regional authority has failed to meet the responsibilities given to it by this division or by any other provision of law.

39003 ARB RESPONSIBILITIES

The State Air Resources Board is the state agency charged with coordinating efforts to attain and maintain ambient air quality standards, to conduct research into the causes of and solution to air pollution, and to systematically attack the serious problem caused by motor vehicles, which is the major source of air pollution in many areas of the state.

40000 LOCAL / STATE RESPONSIBILITIES

The Legislature finds and declares that local and regional authorities have the primary responsibility for control of air pollution from all sources, other than emissions from motor vehicles. The control of emissions from motor vehicles, except as otherwise provided in this division, shall be the responsibility of the state board.

40001 ADOPTION & ENFORCEMENT OF RULES / REGULATIONS

Prevent and Abate Episodes

(a) Subject to the powers and duties of the state board, the districts shall adopt and enforce rules and regulations to achieve and maintain the state and federal ambient air quality standards in all areas affected by emission sources under their jurisdiction, and shall enforce all applicable provisions of state and federal law.

(b) The rules and regulations may, and at the request of the state board shall, provide for the prevention and abatement of air pollution episodes which, at intervals, cause discomfort or health risks to, or damage to property of, a significant number of persons or class of persons.

(c) Prior to adopting any rule or regulation to reduce criteria pollutants, a district shall determine that there is a problem that the proposed rule or regulation will alleviate and that the rule or regulation will promote the attainment or maintenance of state or federal ambient air quality standards.

40702 ADOPTION OF RULES AND REGULATIONS

A district shall adopt rules and regulations and do such acts as may be necessary or proper to execute the powers and duties granted to, and imposed upon, the district by this division and other statutory provisions. No order, rule, or regulation of any district shall, however, specify the design of equipment, type of construction, or particular method to be used in reducing the release of air contaminants from railroad locomotives.

41509 NO LIMITATION ON POWER TO ABATE NUISANCE

No provision of this division, or of any order, rule, or regulation of the state board or of any district, is a limitation on:

(a) The power of any local or regional authority to declare, prohibit, or abate nuisances.

(b) The power of the Attorney General, at the request of a local or regional authority, the state board, or upon his own motion, to bring an action in the name of the people of the State of California to enjoin any pollution or nuisance.

(c) The power of a state agency in the enforcement or administration of any provision of law which it is specifically permitted or required to enforce or administer.

(d) The right of any person to maintain at any time any appropriate action for relief against any private nuisance.

41510 RIGHT OF ENTRY WITH INSPECTION WARRANT

Right of Entry

For the purpose of enforcing or administering any state or local law, order, regulation, or rule relating to air pollution, the executive officer of the state board or any air pollution control officer having jurisdiction, or an authorized representative of such officer, upon presentation of his credentials or, if necessary under the circumstances, after obtaining an inspection warrant pursuant to Title 13 (commencing with Section 1822.50), Part 3 of the Code of Civil Procedure, shall have the right of entry to any premises on which an air pollution emission source is located for the purpose of inspecting such source, including securing samples of emissions therefrom, or any records required to be maintained in connection therewith by the state board or any district.

41700 NO PERSON SHALL DISCHARGE POLLUTANTS

Except as otherwise provided in Section 41705, no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.

41701 OPACITY STANDARDS - NO EMISSIONS SHALL EXCEED RINGELMANN 2

Opacity

Except as otherwise provided in Section 41704, or Article 2 (commencing with Section 41800) of this chapter other than Section 41812, or Article 2 (commencing with Section 42350) of Chapter 4, no person shall discharge into the atmosphere from any source whatsoever any air contaminant, other than uncombined water vapor, for a period or periods aggregating more than three minutes in any one hour which is:

(a) As dark or darker in shade as that designated as No. 2 on the Ringelmann Chart, as published by the United States Bureau of Mines, or

(b) Of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in subdivision (a).

42300 DISTRICT PERMIT SYSTEM

(a) Every district board may establish, by regulation, a permit system that requires, except as otherwise provided in Section 42310, that before any person builds, erects, alters, replaces, operates, or uses any article, machine, equipment, or other contrivance which may cause the issuance of air contaminants, the person obtain a permit to do so from the air pollution control officer of the district.

(b) The regulations may provide that a permit shall be valid only for a specified period. However, the expiration date of any permit shall be extended upon completion of the annual review required pursuant to subdivision (e) of Section 42301 and payment of the fees required pursuant to Section 42311, unless the air pollution control officer or the hearing board has initiated action to suspend or revoke the permit pursuant to Section 42304, 42307, or 42390, that action has resulted in a final determination by the officer or the board to suspend or revoke the permit, and all appeals have been exhausted or the time for appeals from that final determination has been exhausted.

(c) The annual extension of a permit's expiration date pursuant to subdivision (b) does not constitute permit issuance, renewal, reopening, amendment, or any other action subject to the requirements specified in Title V.

42301 PERMIT ISSUANCE - REQUIREMENTS

A permit system established pursuant to Section 42300 shall do all of the following:

(a) Ensure that the article, machine, equipment, or contrivance for which the permit was issued does not prevent or interfere with the attainment or maintenance of any applicable air quality standard.

(b) Prohibit the issuance of a permit unless the air pollution control officer is satisfied, on the basis of criteria adopted by the district board, that the article, machine, equipment, or contrivance will comply with all of the following:

Permit System Shall Do . . .

(1) All applicable orders, rules, and regulations of the district and of the state board.
(2) All applicable provisions of this division.

(c) Prohibit the issuance of a permit to a Title V source if the Administrator of the Environmental Protection Agency objects to its issuance in a timely manner as provided in Title V. This subdivision is not intended to provide any authority to the Environmental Protection Agency to object to the issuance of a permit other than that authority expressly granted by Title V.

(d) Provide that the air pollution control officer may issue to a Title V source a permit to operate or use if the owner or operator of the Title V source presents a variance exempting the owner or operator from Section 41701, any rule or regulation of the district, or any permit condition imposed pursuant to this section, or presents an abatement order that has the effect of a variance and that meets all of the requirements of this part pertaining to variances, and the requirements for the issuance of permits to operate are otherwise satisfied. The terms and conditions of any variance or abatement order may be incorporated into the permit as a compliance schedule, to the extent required by Title V.

(e) Require, upon annual renewal, that each permit be reviewed to determine that the permit conditions are adequate to ensure compliance with, and the enforceability of, district rules and regulations applicable to the article, machine, equipment, or contrivance for which the permit was issued which were in effect at the time the permit was issued or modified, or which have subsequently been adopted and made retroactively applicable to an existing article, machine, equipment, or contrivance, by the district board and, if the permit conditions are not consistent, require that the permit be revised to specify the permit conditions in accordance with all applicable rules and regulations.

(f) Provide for the reissuance or transfer of a permit to a new owner or operator of an article, machine, equipment, or contrivance. An application for transfer of ownership only, or change in operator only, of any article, machine, equipment, or contrivance which had a valid permit to operate within the two-year period immediately preceding the application is a temporary permit to operate. Issuance of the final permit to operate shall be conditional upon a determination by the district that the criteria specified in subdivisions (b) and (e) are met, if the permit was not surrendered as a condition to receiving emission reduction credits pursuant to banking or permitting rules of the district. However, under no circumstances shall the criteria specify that a change of ownership or operator alone is a basis for requiring more stringent emission controls or operating conditions than would otherwise apply to the article, machine, equipment, or contrivance.

42301.6 PERMIT APPROVAL: POWERS AND DUTIES OF AIR POLLUTION CONTROL OFFICER

Near a Schoolsite

(a) Prior to approving an application for a permit to construct or modify a source which emits hazardous air emissions, which source is located within 1,000 feet from the outer boundary of a schoolsite, the air pollution control officer shall prepare a public notice in which the proposed project or modification for which the application for a permit is made is fully described. The notice may be prepared whether or not the material is or would be subject to subdivision (a) of Section 25536, if the air pollution control officer determines and the administering agency concurs that hazardous air emissions of the material may result from an air release, as defined by Section 44303. The notice may be combined with any other notice on the project or permit which is required by law.

(b) The air pollution control officer shall, at the permit applicant's expense, distribute or mail the public notice to the parents or guardians of children enrolled in any school that is located within one-quarter mile of the source and to each address within a radius of 1,000 feet of the proposed new or modified source at least 30 days prior to the date final action on the application is to be

Public Comments Considered

taken by the officer. The officer shall review and consider all comments received during the 30 days after the notice is distributed, and shall include written responses to the comments in the permit application file prior to taking final action on the application.

(1) Notwithstanding Section 49073 of the Education Code, or any other provision of law, the information necessary to mail notices required by this section shall be made available by the school district to the air pollution control officer.

(2) Nothing in this subdivision precludes, at the discretion of the air pollution control officer and with permission of the school, the distribution of the notices to the children to be given to their parents or guardians.

(c) Notwithstanding subdivision (b), an air pollution control officer may require the applicant to distribute the notice if the district had such a rule in effect prior to January 1, 1989.

(d) The requirements for public notice pursuant to subdivision (b) or a district rule in effect prior to January 1, 1989, are fulfilled if the air pollution control officer or applicant responsible for giving the notice makes a good faith effort to follow the procedures prescribed by law for giving the notice, and, in these circumstances, failure of any person to receive the notice shall not affect the validity of any permit subsequently issued by the officer.

(e) Nothing in this section shall be deemed to limit any existing authority of any district.

(f) An applicant for a permit shall certify whether the proposed source or modification is located within 1,000 feet of a schoolsite. Misrepresentation of this fact may result in the denial of a permit.

(g) The notice requirements of this section shall not apply if the air pollution control officer determines that the application to construct or modify a source will result in a reduction or equivalent amount of air contaminants, as defined in Section 39013, or which are hazardous air emissions.

(h) As used in this section:

(1) "Hazardous air emissions" means emissions into the ambient air of air contaminants which have been identified as a toxic air contaminant by the state

board or by the air pollution control officer for the jurisdiction in which the project is located. As determined by the air pollution control officer, hazardous air emissions also means emissions into the ambient air from any substances identified in subdivisions (a) to (f), inclusive, of Section 44321 of the Health and Safety Code.

Toxic Air Contaminant

(2) "Acutely hazardous material" means any material defined pursuant to subdivision (a) of Section 25532.

42301.7 AIR CONTAMINANTS - THREATENED RELEASE

(a) If the air pollution control officer determines there is a reasonably foreseeable threat of a release of an air contaminant from a source within 1,000 feet of the boundary of a school that would result in a violation of Section 41700 and impact persons at the school, the officer shall, within 24 hours, notify the administering agency and the fire department having jurisdiction over the school.

(b) The administering agency may, in responding to a reasonably foreseeable threat of a release, do any of the following:

(1) Review the facility's risk management and prevention plan prepared pursuant to Section 25534 to determine whether the program should be modified, and, if so, require submission of appropriate modifications. Notwithstanding any other provision of law, the administering agency may order modification and implementation of a revised risk management and prevention plan at the earliest feasible date.

(2) If the facility has not filed a risk management and prevention plan with the administering agency, require the preparation and submission of a plan to the administering agency pursuant to Section 25534. Notwithstanding any other provision of law, the administering agency may require the filing of a risk management and prevention plan and its implementation at the earliest feasible date.

(c) The air pollution control officer may, in responding to a reasonably foreseeable threat of a release, do any of the following:

(1) If necessary, issue an immediate order to prevent the release or mitigate the reasonably foreseeable threat of a release in violation of Section 41700 pending a hearing pursuant to Section 42450 when there is a substantial probability of an injury to persons at a school resulting from a release that makes it reasonably necessary to take immediate action to prevent, reduce, or mitigate

Prevent, Reduce, Mitigate Injury

that injury. The officer may not issue such an order unless there is written concurrence to issue the order by a representative of the administering agency.

(2) Apply to the district board for issuance of an order for abatement pursuant to Section 42450.

(d) Nothing in this section limits any existing authority of any district.

42303 INFORMATION DISCLOSURE - AIR CONTAMINANT DISCHARGE

An air pollution control officer, at any time, may require from an applicant for, or the holder of, any permit provided for by the regulations of the district board, such information, analyses, plans, or specifications which will disclose the nature, extent, quantity, or degree of air contaminants which are, or may be, discharged by the source for which the permit was issued or applied.

42303.5 FALSE STATEMENTS IN PERMIT APPLICATIONS

No person shall knowingly make any false statement in any application for a permit, or in any information, analyses, plans, or specifications submitted in conjunction with the application or at the request of the air pollution control officer.

42304 PERMIT SUSPENSION (FAILURE TO SUPPLY INFORMATION)

If, within a reasonable time, the holder of any permit issued by a district board willfully fails and refuses to furnish the information, analyses, plans, or specifications requested by the district air pollution control officer, such officer may suspend the permit. Such officer shall serve notice in writing of such suspension and the reasons therefor on the permittee.

42352 VARIANCE - FINDINGS REQUIRED FOR ISSUANCE

(a) No variance shall be granted unless the hearing board makes **all** of the following findings:

Variance Conditions

(1) That the petitioner for a variance is, or will be, in violation of Section 41701 or of any rule, regulation, or order of the district.

(2) That, due to conditions beyond the reasonable control of the petitioner, requiring compliance would result in either (A) an arbitrary or unreasonable taking of property, or (B) the practical closing and elimination of a lawful

business. In making those findings where the petitioner is a public agency, the hearing board shall consider whether or not requiring immediate compliance would impose an unreasonable burden upon an essential public service. For purposes of this paragraph, "essential public service" means a prison, detention facility, police or firefighting facility, school, health care facility, landfill gas control or processing facility, sewage treatment works, or water delivery operation, if owned and operated by a public agency.

Essential Public Service

(3) That the closing or taking would be without a corresponding benefit in reducing air contaminants.

(4) That the applicant for the variance has given consideration to curtailing operations of the source in lieu of obtaining a variance.

(5) During the period the variance is in effect, that the applicant will reduce excess emissions to the maximum extent feasible.

(6) During the period the variance is in effect, that the applicant will monitor or otherwise quantify emission levels from the source, if requested to do so by the district, and report these emission levels to the district pursuant to a schedule established by the district.

(b) As used in this section, "public agency" means any state agency, board, or commission, any county, city and county, city, regional agency, public district, or other political subdivision. [Further stipulations of Subsection 42352.5 are not included in this technical manual.]

42400 PENALTIES, CRIMINAL - MISDEMEANOR

Criminal Misdemeanor

(a) Except as otherwise provided in Section 42400.1, 42400.2, or 42400.3, any person who violates this part, or any rule, regulation, permit, or order of the state board or of a district, including a district hearing board, adopted pursuant to Part 1 (commencing with Section 39000) to Part 4 (commencing with Section 41500), inclusive, is guilty of a misdemeanor and is subject to a fine of not more than one thousand dollars ($1,000) or imprisonment in the county jail for not more than six months, or both.

(b) If a violation under subdivision (a) with regard to the failure to operate a vapor recovery system on a gasoline cargo tank is directly caused by the actions of an employee under the supervision of, or of any independent contractor working for, any person subject to this part, the employee or independent contractor, as the case may be, causing the violation is guilty of a misdemeanor and is punishable as provided in subdivision (a). That liability shall not extend to the person employing the employee or retaining the independent contractor, unless that person is separately guilty of an action that violates this part.

(c) The recovery of civil penalties pursuant to Section 42402, 42402.1, 42402.2, or 42402.3 precludes prosecution pursuant to this section for the same offense. When a district refers a violation to a prosecuting agency, the filing of a criminal complaint is grounds requiring the dismissal of any civil action brought pursuant to this article for the same offense.

Each Day a Separate Offense

(d) Each day during any portion of which a violation of subdivision (a) occurs is a separate offense.

42400.1 PENALTIES, CRIMINAL - NEGLIGENCE

Criminal Misdemeanor

(a) Any person who negligently emits an air contaminant in violation of any provision of this part or any rule, regulation, permit, or order of the state board or of a district pertaining to emission regulations or limitations is guilty of a misdemeanor and is subject to a fine of not more than fifteen thousand dollars ($15,000) or imprisonment in the county jail for not more than nine months, or both.

(b) Any person who owns or operates any source of air contaminants in violation of Section 41700 which causes actual injury, as defined in paragraph (2) of subdivision (d) of Section 42400.2, to the health or safety of a considerable number of persons or the public is guilty of a misdemeanor and is punishable as provided in subdivision (a).

(c) Each day during any portion of which a violation occurs is a separate offense.

(d) The recovery of civil penalties pursuant to Section 42402, 42402.1, 42402.2, or 42402.3 precludes prosecution pursuant to this section for the same offense. When a district refers a violation to a prosecuting agency, the filing of a criminal complaint is grounds requiring the dismissal of any civil action brought pursuant to this article for the same offense.

42400.2 PENALTIES, CRIMINAL - KNOWINGLY, DOCUMENT FALSIFICATION / FAILURE TO TAKE CORRECTIVE ACTION

Criminal Knowingly

(a) Any person who emits an air contaminant in violation of any provision of this part, or any order, rule, regulation, or permit of the state board or of a district pertaining to emission regulations or limitations, and who knew of the emission and failed to take corrective action within a reasonable period of time under the circumstances, is guilty of a misdemeanor and is subject to a fine of not more than twenty-five thousand dollars ($25,000) or imprisonment in the county jail for not more than one year, or both.

Corrective Action

(b) For purposes of this section, "corrective action" means the termination of the emission violation or the grant of a variance from the applicable order, rule, regulation, or permit pursuant to Article 2 (commencing with Section 42350). If a district regulation regarding process upsets or equipment breakdowns would allow continued operation of equipment which is emitting air contaminants in excess of allowable limits, compliance with that regulation is deemed to be corrective action.

(c) Any person who, knowingly and with intent to deceive, falsifies any document required to be kept pursuant to any provision of this part, or any rule, regulation, permit, or order of the state board or of a district, is guilty of a misdemeanor and is punishable as provided in subdivision (a).

(d) (1) Any person who owns or operates any source of air contaminants in violation of Section 41700 which causes actual injury to the health or safety of a considerable number of persons or the public, and who knew of the emission and failed to take corrective action within a reasonable period of time under the circumstances, is guilty of a misdemeanor and is punishable as provided in subdivision (a).

(2) As used in this subdivision, "actual injury" means any physical injury which, in the opinion of a licensed physician and surgeon, requires medical treatment involving more than a physical examination.

(e) Each day during any portion of which a violation occurs constitutes a separate offense.

(f) The recovery of civil penalties pursuant to Section 42402, 42402.1, 42402.2, or 42402.3 precludes prosecution pursuant to this section for the same offense. When a district refers a violation to a prosecuting agency, the filing of a criminal complaint is grounds requiring the dismissal of any civil action brought pursuant to this article for the same offense.

42400.3 PENALTIES, CRIMINAL - WILLFULLY, INTENTIONALLY

Criminal Willfully

(a) Any person who willfully and intentionally emits an air contaminant in violation of any provision of this part or any rule, regulation, permit, or order of the state board or of a district, pertaining to emission regulations or limitations is guilty of a misdemeanor and is subject to a fine of not more than fifty thousand dollars ($50,000) or imprisonment in the county jail for not more than one year, or both.

(b) The recovery of civil penalties pursuant to Section 42402, 42402.1, 42402.2, or 42402.3 precludes prosecution pursuant to this section for the same offense. When a district refers a violation to a prosecuting agency, the filing of a criminal complaint is grounds requiring the dismissal of any civil action brought pursuant to this article for the same offense.

(c) Each day during any portion of which a violation occurs constitutes a separate offense.

42401 PENALTIES, CIVIL - VIOLATING ORDER OF ABATEMENT

Civil Abatement Violation

Any person who intentionally or negligently violates any order of abatement issued by a district pursuant to Section 42450, by a hearing board pursuant to Section 42451, or by the state board pursuant to Section 41505 is liable for a civil penalty of not more than twenty-five thousand dollars ($25,000) for each day in which the violation occurs.

Civil

42402 PENALTIES, CIVIL - GENERAL VIOLATIONS

Strict Liability

(a) Except as otherwise provided in subdivision (b) or in Section 42402.1, 42402.2, or 42402.3, any person who violates this part, any order issued pursuant to Section 42316, or any rule, regulation, permit, or order of a district, including a district hearing board, or of the state board issued pursuant to Part 1 (commencing with Section 39000) to Part 4 (commencing with Section 41500), inclusive, is strictly liable for a civil penalty of not more than one thousand dollars ($1,000).

(b) (1) Any person who violates any provision of this part, any order issued pursuant to Section 42316, or any rule, regulation, permit, or order of a district, including a district hearing board, or of the state board issued pursuant to Part 1 (commencing with Section 39000) to Part 4 (commencing with Section 41500), inclusive, is strictly liable for a civil penalty of not more than ten thousand dollars ($10,000).

(2) Where a civil penalty in excess of one thousand dollars ($1,000) for each day in which the violation occurs is sought, there is no liability under this subdivision if the person accused of the violation alleges by affirmative defense and establishes that the violation was caused by an act which was not the result of intentional or negligent conduct. In a district in which a Title V permit program has been fully approved, this paragraph shall not apply to a violation of federally enforceable requirements that occurs at a Title V source.

(c) Each day during any portion of which a violation occurs is a separate offense.

42402.1 PENALTIES, CIVIL - NEGLIGENCE OR ACTUAL INJURY

Civil Negligence

(a) Any person who negligently emits an air contaminant in violation of this part or any rule, regulation, permit, or order of the state board or of a district pertaining to emission regulations or limitations is liable for a civil penalty of not more than fifteen thousand dollars ($15,000).

Owner or Operator is Liable

(b) Any person who owns or operates any source of air contaminants in violation of Section 41700 which causes actual injury, as defined in paragraph (2) of subdivision (d) of Section 42400.2, to the health or safety of a considerable number of persons or the public is liable for a civil penalty as provided in subdivision (a).

(c) Each day during any portion of which a violation occurs is a separate offense.

42402.2 PENALTIES, CIVIL - KNOWINGLY, DOCUMENT FALSIFICATION, FAILURE TO TAKE CORRECTIVE ACTION

Civil Knowingly

(a) Any person who emits an air contaminant in violation of any provision of this part, or any order, rule, regulation, or permit of the state board or of a district pertaining to emission regulations or limitations, and who knew of the emission and failed to take corrective action, as defined in subdivision (b) of Section 42400.2, within a reasonable period of time under the circumstances, is liable for a civil penalty, of not more than twenty-five thousand dollars ($25,000).

(b) Any person who, knowingly and with intent to deceive, falsifies any document required to be kept pursuant to any provision of this part, or any rule, regulation, permit, or order of the state board or of a district, is subject to the same civil penalty as provided in subdivision (a).

(c) Any person who owns or operates any source of air contaminants in violation of Section 41700 which causes actual injury, as defined in paragraph (2) of subdivision (d) of Section 42400.2, to the health or safety of a considerable number of persons or the public, and who knew of the emission and failed to take corrective action, as defined in subdivision (b) of Section 42400.2, within a reasonable period of time under the circumstances, is subject to a civil penalty as provided in subdivision (a).

(d) Each day during any portion of which a violation occurs is a separate offense.

42402.3 PENALTIES, CIVIL - WILLFULLY AND INTENTIONALLY

(a) Any person who willfully and intentionally emits an air contaminant in violation of this part or any rule, regulation, permit, or order of the state board, or of a district, pertaining to emission regulations or limitations, is liable for a civil penalty of not more than fifty thousand dollars ($50,000).

(b) Each day during any portion of which a violation occurs is a separate offense.

42402.5 PENALTIES, CIVIL - ADMINISTRATIVE

Civil Administrative

In addition to any civil and criminal penalties prescribed under this article, a district may impose administrative civil penalties for a violation of this part, or any order, permit, rule, or regulation of the state board or of a district, including a district hearing board, adopted pursuant to Part 1 (commencing with Section 39000) to Part 4 (commencing with Section 41500), inclusive, if the district board has adopted rules and regulations specifying procedures for the imposition and amounts of these penalties. No administrative civil penalty levied pursuant to this section may exceed five hundred dollars ($500) for each violation. However, nothing in this section is intended to restrict the authority of a district to negotiate mutual settlements under any other penalty provisions of law which exceeds five hundred dollars ($500).

42403 PENALTIES, CIVIL - RELEVANT CIRCUMSTANCES

(a) The civil penalties prescribed in Sections 39674, 42401, 42402, 42402.1, 42402.2, and 42402.3 shall be assessed and recovered in a civil action brought in the name of the people of the State of California by the Attorney General, by any district attorney, or by the attorney for any district in which the violation occurs in any court of competent jurisdiction.

(b) In determining the amount assessed, the court, or in reaching any settlement, the district, shall take into consideration all relevant circumstances, including, but not limited to, the following:

Civil Penalties May Depend On . . .

(1) The extent of harm caused by the violation.
(2) The nature and persistence of the violation.
(3) The length of time over which the violation occurs.
(4) The frequency of past violations.
(5) The record of maintenance.
(6) The unproven or innovative nature of the control equipment.
(7) Any action taken by the defendant, including the nature, extent, and time of response of the cleanup and construction undertaken, to mitigate the violation.
(8) The financial burden to the defendant.

42404.5 STATUTE OF LIMITATIONS FOR CIVIL ACTIONS

Any limitation of time applicable to actions brought pursuant to Section 42403 shall not commence to run until the offense has been discovered, or could reasonably have been discovered.

42450 ORDERS OF ABATEMENT, DISTRICT BOARD: AUTHORITY, NOTICE AND HEARING

The district board may, after notice and a hearing, issue an order for abatement whenever it finds that any person is constructing or operating any article, machine, equipment, or other contrivance without a permit required by this part, or is in violation of Section 41700 or 41701 or of any order, rule, or regulation prohibiting or limiting the discharge of air contaminants into the air.

In holding such a hearing, the district board shall be vested with all the powers and duties of the hearing board. Notice shall be given, and the hearing shall be held, pursuant to Chapter 8 (commencing with Section 40800) of Part 3.

600 TOXICS

601 TOXICS BACKGROUND

TAC Defined

According to the Condensed Chemical Dictionary, a solvent is a "substance capable of dissolving another substance (solute) to form a uniformly dispersed mixture (solution) at the molecular or ionic size level." A solvent used in a coating is a liquid or blend of liquids which are used to dissolve or disperse the film-forming particles and which evaporate during drying. A solvent may evaporate at a certain temperature and pressure, and in the process may release a toxic air contaminant. A toxic air contaminant (TAC) is defined as an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health.

Even though TAC solvents are not the main focus in this manual (VOC solvents are--although many VOC solvents are also TAC solvents), solvent manufacturers and source users need to be aware that restrictions have been and will continue to be placed on toxic solvents used in various stationary source categories (e.g., solvents used in degreasing, dry cleaning, non-architectural surface coatings, and printing) that could limit or prevent the use of such solvents in a district. In addition, when solvents are reformulated to comply with volatile organic compounds (VOC) regulations in certain solvent-use categories, it could be an economic and health risk to replace certain VOCs with compounds or elements that have been identified as TACs or which may be so designated in the future.

Assembly Bill 1807

In California, TACs have been identified using the process stipulated in Assembly Bill (AB) 1807 (Health and Safety Code Sections 39650 et. seq., Food and Agriculture Code Sections 14021 et seq.). In this process, the ARB and the Office of Environmental Health Hazard Assessment develop a comprehensive report on the health risks associated with a compound or element. After public review and comment, the report is submitted to the Scientific Review Panel, a group of experts in various sciences.

The final decision regarding a candidate substance is made by the ARB at a public hearing. After identification of toxic air contaminants, the control phase begins. During this phase, sources are evaluated to determine the necessity for controls. If found appropriate, control measures are developed by staff and submitted to the ARB to be considered for adoption into the California Code of Regulations (CCR). At the beginning of 1993, there were 18 substances which had been identified by the ARB as TACs (See Table 600.1 for a listing of them) and incorporated into Title 17 of the CCR, Section 9300.

However, this list was greatly expanded in 1993. With the signing into law of AB 2728 in 1992, (see HSC Chapter 3.5, Article 2.5) substantial changes to the TAC Program were enacted. AB 2728 requires specific actions to be taken by the ARB to achieve greater uniformity between the California and the federal air toxics programs. AB 2728 requires the ARB to identify as TACs the 189 substances which the federal government has listed as *hazardous air pollutants* (HAPs) in the federal Clean Air Act Amendments (CAAA) of 1990.

Hazardous Air Pollutants

Federal Source Categories

As a consequence of the 1990 CAAA, the federal Environmental Protection Agency (EPA) published in the Federal Register of July 16, 1992, an initial list of 16 categories of major sources and 1 category of area sources that emitted HAPs for which new federal NESHAPS regulations containing MACT (maximum achievable control technology) standards would be promulgated. The major source categories contained 166 subcategories, and the area source category contained 8 subcategories.

Major & Area Source Categories

According to the CAAA, a major source is any stationary source or group of stationary sources located within a contiguous area that emits or has the potential to emit 10 tons per year of any HAP or 25 tons per year of any combination of HAPs. An area source category is any stationary source of HAPs that is not a major source, but the Administrator must also make the finding that such a category or subcategory presents a threat of adverse effects to human health or the environment. By law, the EPA must promulgate a national emission standard for all of these sources by November 15, 2000.

However, if it is not feasible for the EPA Administrator to prescribe or enforce an emission standard (e.g. mg/m^3, ppm, g/process rate) for control of a HAP, then the Administrator may, in lieu of, promulgate a design, equipment, work practice, or combination standard.

Promulgated federal emission standards become State airborne toxic control measures (ATCMs) under California's AB 2728. If the State has specified an emission standard more stringent then the federal standard, then the State standard shall prevail. The USEPA may independently enforce the federal standard itself under federal law. The ARB may also revise the federal standard if it is not as stringent as required by State law, or the ARB may seek equivalency of its ATCM standards where it believes that is possible. For compounds or substances with no federal emissions standard, ATCMs may still be adopted following the original AB 1807 State process.

List of HAPs & TACs

A list of the 189 federal HAPs, including the 18 substances previously identified by the ARB as TACs in California, is presented in Appendix D. Due to the length of the list, it is not included here. Solvent-use categories which should be of interest to solvent users because they are currently regulated, to some degree, by the federal EPA, the ARB, or both are: dry cleaning, degreasing, non-architectural surface coatings (aerospace coatings and magnetic tape manufacturing). Future EPA NESHAPS regulations to be promulgated that affect solvents used by stationary sources include 12 more source-coating and two printing-operation regulations. A short discussion of the current regulations affecting solvent-use categories is presented in the following subsections.

Table 600.1
Toxic Air Contaminants Identified by ARB

Asbestos	Benzene	Cadmium
Carbon Tetrachloride	Chloroform	Chromium VI
Dioxins	Ethylene Dibromide	Ethylene Dichloride
Ethylene Oxide	Formaldehyde	Inorganic Arsenic
Methylene Chloride	Nickel	Perchloroethylene
Trichloroethylene	Vinyl Chloride	1,3-Butadiene

602 DEGREASING WITH HALOGENATED SOLVENTS

As of August 1995, six of the toxic substances listed in Appendix D have had a control measure promulgated by the federal EPA that regulates their use in solvent cleaning operations (degreasing). These compounds are: carbon tetrachloride, chloroform, perchloroethylene, 1,1, 1-trichloroethane [methyl chloroform], trichloroethylene, and methylene chloride. The control measure that regulates these compounds is EPA's National Emission Standard for Halogenated Solvent Cleaning, promulgated by the EPA in final form on December 2, 1994 and becoming effective as an ATCM in California on the same date, since State law mandates this action [H&SC Section 39658 (b)(1)].

Provisions of the USEPA/ARB Degreasing Regulation

In general, the provisions of the USEPA/ARB degreasing regulation require a decision by the source on what control option to adopt (available options are detailed in the regulation) and the submittal or attainment of:

1) an initial notification letter to the USEPA with specified information that essentially says that the source is affected by the regulation,

2) an initial compliance report with specified information that essentially says the source is in compliance with all applicable requirements,

3) an annual compliance report that says the source was in compliance with the requirements for the past year,

4) an exceedance report every six months that says whether or not any of the required monitored parameters were exceeded in that time frame, and

5) compliance with emission, design, and/or work practice standards by specified dates.

The regulation applies to (1) owners or operators of solvent cleaning machines where the solvent used contains 5 percent or more by weight of any combination of the solvents identified on the previous page, (2) solvent cleaning machines that feature cold-solvent cleaning and batch-vapor and in-line cleaning. The regulation also has somewhat different reporting due dates and compliance dates with emission, design, and work practice standards for existing and new solvent-cleaning machines. USEPA's Guidance Document for the Halogenated Solvent Cleaning NESHAP (without appendices because of its large size) is presented in Appendix E to assist you in complying with the NESHAPS rule for halogenated solvents. The rule itself is presented in Appendix F.

We did not believe it necessary to provide process and control or inspection information on this NESHAPS rule since this would essentially duplicate similar information already provided in this solvent cleaning (degreasing) manual for non-halogenated solvents. Many of California's air pollution and air quality management districts have degreasing rules, and these districts will probably amend these rules to some extent to make them compatible with the NESHAPS halogenated solvent cleaning rule.

603 DRY CLEANING WITH PERCHLOROETHYLENE

Perchloroethylene is both a VOC and a toxic solvent used in the dry cleaning industry for cleaning clothes and other fabrics. Both the federal EPA and the California ARB have adopted measures to control its emissions. The ARB published a source information manual in October 1993 that contained detailed information on the dry cleaning process, solvents used in dry cleaning (Stoddard, perchloroethylene, CFC-113), how to inspect dry cleaning facilities, plus overviews of (1) local California district rules that regulated drycleaning as a source of VOC emissions and (2) of the federal and California dry cleaning rules that regulated drycleaning as a source of toxic, perchloroethylene emissions. You may wish to review this document. The CAP also has a handbook for dry cleaning. It is available in both the English and the Korean languages.

ARB Equivalency Application

On July 6, 1995, the ARB submitted to the federal EPA an application to implement and enforce the ARB's ATCM for perchloroethylene dry cleaning operations in lieu of the federal National Perchloroethylene Air Emissions Standards for Dry Cleaning Facilities. The ARB's application, however, applies only to area sources, leaving intact the provisions of the perchloroethylene NESHAPS rule that apply to major sources. If approved by the USEPA, major perchloroethylene dry cleaning facilities would have to comply with the federal rule and the ARB's ATCM, whereas area sources would only have to comply with the California rule.

604 COATING OPERATIONS

The coatings used by industrial stationary sources to cover some kind of product typically feature solvents to dissolve and disperse the resins and pigments found in the coating. Other solvents in coating operations are used to clean the product before it is coated and to clean the coating equipment after the coating is applied. Many of the solvents used in coating operations are VOCs, and some of these, in turn, release emissions that are TACs. Currently, we are concerned with two coating source categories that recently have had a final NESHAPS rule promulgated by the federal EPA. Many other coating source categories, as noted earlier, will have their own NESHAPS rules promulgated between now and the year 2001. The currently released NESHAPS rules are for aerospace coatings and for magnetic tape manufacturing. A short discussion of the regulations affecting these coating source categories is presented in the following subsections.

604.1 AEROSPACE COATING OPERATIONS

The new federal NESHAPS rule regulating the release of toxic emissions from aerospace coating operations is entitled National Emission Standards for Aerospace Manufacturing and Rework Facilities, promulgated in the Federal Register in final form on September 1, 1995. Such facilities produce or repair aerospace vehicles or vehicle parts, such as airplanes, helicopters, space vehicles, rockets, and missiles. Coating processes that the rule addresses include cleaning operations, primer and topcoat coating operations, depainting operations, and chemical milling maskant operations. According to the USEPA "Fact Sheet" on the aerospace coatings rule, "Most of the control requirements outlined in the final rule are based on pollution prevention operations instead of end of pipe controls." Solvents used in these operations and that release TACs into the atmosphere are methylene chloride, toluene, xylene, methyl ethyl ketone (MEK), ethylene glycol, and glycol ethers.

Aerospace Solvents

A few California districts (e.g., San Diego, South Coast, Bay Area) have rules regulating VOC emissions from solvents used in aerospace coating operations. These rules have similarities and differences with the new federal NESHAPS rule on aerospace coatings. For example, as far as similarities go, both rules limit primer and topcoat VOC or TAC content levels (lbs/gal) to the same level, have vapor pressure limitations for cleaning solvents, allow similar applications methods, have limitations on the VOC or TAC content of maskants, require cleaning solvents or solvent-laden rags to be stored in closed containers, allow the use of control equipment to achieve the emissions allowed, etc.

VOC & Toxic Rules Comparison

As far as differences go, the NESHAPS rule, in part, prohibits any organic HAPs to be released during the depainting process unless add-on control technology is used, has stricter HAP limits for the content of maskants, and requires topcoats and primers to be applied in a booth or hanger equipped with airflow over the part or assembly being coated, and that airflow must then be exhausted through a dry particulate filter or waterwash system. The NESHAPS rule also has reporting requirements not in the VOC rules.

In July 1990, the ARB published a process and control manual on aerospace coating operations using VOCs entitled Aerospace Coating Operations. This manual contained detailed information on the aerospace coating processes, controls used, how to inspect aerospace coating facilities, and the district VOC rules used to regulate such operations. This manual is scheduled for updating in the State fiscal year 1995-96, and will include a chapter on toxics. However, most of the information in it now should still be useful to any person needing to inspect an aerospace coating source (such as government-agency or source inspectors) or other individuals interested in the topic. For specific NESHAPS requirements, however, the interested party should refer to the already identified NESHAPS rule.

ARB Aerospace Manual

As already noted, a few California districts have VOC rules that apply to aerospace coating operations. It is possible that these districts will amend these rules to make them compatible with the federal NESHAPS rule, or they may simply enforce the aerospace/NESHAPS MACT rule along with the VOC rules.

604.2 MAGNETIC TAPE COATING OPERATIONS

The new federal NESHAPS rule regulating the release of toxic emissions from magnetic tape manufacturing is entitled National Emissions Standard for Magnetic Tape Manufacturing Operations, promulgated in the Federal Register on December 15, 1994. Affected facilities include those sources manufacturing audio and video cassettes and computer diskettes. According to the EPA Fact Sheet on the rule, "the air toxic emissions [addressed in the rule] predominantly come from solvents used in the coating operation and cleaning of equipment. Some particulate air toxic emissions may come from the transfer of magnetic particles to the coating." The solvent TAC "emissions result from the evaporation of solvents from the (1) storage tanks, (2) coating mix preparation area, (3) coating application/flashoff area, (4) drying oven, (5) packaging and labeling operations, (6) waste handling area, (7) cleaning activities, and (8) piping fittings." The TAC solvents involved to the greatest extent in magnetic tape manufacturing processes are methyl ethyl ketone (MEK), toluene, and methyl isobutyl ketone (MIBK).

TACs Involved In Magnetic Tape Mfg.

Other TACs involved in the magnetic tape manufacturing process are toluene diisocyanate, ethylene glycol, methanol, xylenes, chromium and cobalt compounds (as particulates), ethyl benzene, and acetaldehyde. For major sources, the rule has control requirements, a limit on the usage of air toxics, and reporting and recordkeeping requirements. The federal EPA Fact Sheet summarizing the rule requirements is presented in Appendix G.

The California Air Resources Board (ARB) has no air toxic control measure (ATCM) for magnetic tape manufacturing operations, although a few of

600 TOXICS

California's air pollution control and air quality management districts (e.g. the Bay Area and the South Coast districts) do have rules regulating VOCs from paper, fabric, and film coating operations. It is the film-coating portions of these rules that bear upon magnetic-tape manufacturing operations. However, these districts' rules don't appear to be as encompassing as the new federal NESHAPS rule for magnetic tape manufacturing operations.

Controls for Magnetic Tape Operations

Controls identified by the new NESHAPS rule to limit the release of toxic solvent emissions into the atmosphere include incinerators, carbon adsorbers, condensers, and wastewater treatment devices. The identified control in the rule to limit the release of toxic particulates (chromium and cobalt compounds) is a baghouse. The ARB has published several technical source manuals describing the control and inspection processes associated with each of these types of equipment. These manuals are entitled Incinerators (Sept. 1993), Baghouses (June 1991), VOC Control Devices, Scrubbers (published May 1995 and including information on carbon adsorption and condensers), and Petroleum Refining (published July 1994 and including information on wastewater treatment).

The ARB staff expect that sometime in the future a separate source manual about the magnetic tape manufacturing process will probably be developed and published that includes process, control, rule, and inspection information specifically related to the magnetic-tape manufacturing operation. Until then, the above referenced manuals should provide very useful information to agency and source inspectors on the nature of inspections and controls associated with the magnetic-tape manufacturing process.

605 ADDITIONAL HEALTH INFORMATION

Additional health information pertaining to toxic air contaminants may be obtained by writing to: Air Resources Board, Stationary Source Division, P.O. Box 2815, Sacramento, CA 95812.

GLOSSARY

The definitions presented for the following terms and equipment are provided to assist the user of this manual to gain a *general* understanding degreasing operations. These definitions are generally accepted by regulatory agencies and the degreasing industry, but may differ slightly from specific district rule interpretations. These definitions are not provided for rule interpretation. Those interpretations should be made through your formal rule interpretation process.

Absorption - An attraction between a liquid and a gas. The process of removing a gas pollutant by dissolving the pollutant in a liquid.

Active Solvent - A liquid which can dissolve a substance when used alone.

Adsorption - An attraction between a solid and a gas, or a solid and a liquid, when they are in contact. Drinking up a liquid or gas pollutant, done by a solid surface. Carbon adsorbing VOC from an air stream.

Air Blanket - The layer of air inside the solvent cleaning machine freeboard which extends from the solvent/air interface to the top coil of the freeboard refrigeration device. The center of the air blanket is equidistant from the sides and from the top and bottom of the air blanket.

Aliphatic Solvent - VOC primarily comprised of straight chain hydrocarbons. Includes mineral spirits, kerosene, and hexane.

Aromatic Solvents - VOCs which contain an unsaturated ring of carbon atoms, including benzene, naphthalene, anthracene and their derivatives. Toluene (toluol) and xylene (xylol) are commonly used aromatics.

ASTM - American Society for Testing and Materials

ATCMs - Air toxic control measures.

Atomization - The formation of tiny liquid droplets from spray.

Automated Parts Handling System - A mechanical device that carries all parts and parts baskets at a controlled speed, from the initial loading of the soiled parts through the removal of the cleaned parts. These include, but are not limited to, hoists and conveyors.

GLOSSARY

Banking - A system of recording qualified emission reductions for later use in bubble, offset, or netting transactions.

Batch-Loaded (Batch) Cleaning Machine - A solvent cleaning machine in which individual parts or a set of parts move through the entire cleaning cycle before new parts are introduced into the machine.

Bi-Parting Cover - An automatic cover that consists of two halves that slide horizontally when the cover is being opened or closed. It can be closed while parts are in the solvent cleaning machine.

Bubble - A trade-off emission assessment system in which existing sources propose alternative means to comply with a set of emission limitations. Under the bubble concept, sources can control more than required at one emission point, where control costs are relatively low, in return for a comparable relaxation of controls at a second emission point where costs are high.

Carbon Adsorber - An add-on control device that uses activated carbon to adsorb VOCs from a gas stream. The VOCs are later recovered from the carbon, usually by steam stripping.

Carburetor Cleaning Machine - A small maintenance solvent cleaning machine or parts washer that uses room temperature liquid solvent and solvent blends to clean parts (typically carburetors.) It has a water layer over the solvent that provides control of emissions. Carburetor cleaning machines typically consist of a pail containing the solvent and water layer, a basket in which parts are placed, and a gasketed cover containing a motor which rotates the basket.

Chemical Maskants - Coatings which are applied to a component to protect an area when performing chemical milling, anodizing, aging, bonding, plating, etching, and/or other chemical surface operations on the component.

Chlorinated Solvents - Organic solvents which contain chlorine. Includes 1,1,1 trichloroethane and methylene chloride.

Clean Liquid Solvent - Fresh, unused solvent, or used solvent that has been filtered, skimmed, and/or distilled to remove soils (e.g., skimmed of oils or sludge and strained of metal chips.)

Clean-Up of Equipment - Soil removal from equipment such as at the end of shift operations. Clean-up solvents are subject to requirements designed to minimize solvent emissions.

Closed Containers - Containers closed to the atmosphere. All containers should be tightly sealed, and all openings, including bungholes, should be sealed as well.

Cold Cleaning Machine - Any batch loaded solvent cleaning spray sink, dip tank or other device containing and using non-boiling liquid solvent to clean or remove soils from the surfaces of any part or item.

Condenser Equipment: Any equipment, such as condenser coils or water jacket, used to condense solvent vapor in a vapor degreaser.

Condenser Flow Control Device (Switch) - A control device, usually equipped with a temperature sensor and manual reset response switch, which turns off the sump heater if the condenser water fails to circulate or the temperature of the water rises above the designated operating temperature.

Control Technique Guidelines - EPA documents to assist states in defining reasonably available control technology (RACT) for major sources of VOCs. These documents provide information on the economic and technological feasibility of available techniques. In some cases limits are suggested for VOC emissions.

Conveyorized Solvent Cleaner - Any continuously loaded solvent cleaning tank or other device using boiling or non-boiling solvent to clean or remove soils, oils, dirt, and greases from the surface of any part or item.

Corrosion - The deterioration of metal or of concrete by chemical or electrochemical reaction resulting from exposure to weathering, moisture, chemicals, or other agents in the environment in which it is placed.

Cover - A lid, top or portal cover for a solvent cleaning machine. Types of covers include but are not limited to bi-parting, roll-top, and hinged covers.

GLOSSARY

Criteria Pollutant - A pollutant for which a criteria document has been issued, as described by Section 108 of the Clean Air Act. Criteria pollutants are nitrogen dioxide, sulfur dioxide, ozone, particulate matter, carbon monoxide, and lead. A national ambient air quality standard (NAAQS) exists for each criteria pollutant.

Density - Measure of mass per unit of volume, i.e. grams per liter and pounds per gallon. One pound per gallon approximately equals 119.8 grams per liter. Density used for general solvent is 882 g/l or 7.36 lb/gal.

Designated Pollutant - A pollutant that is not a criteria pollutant (as described in Section 108 of the Clean Air Act) or a hazardous air pollutant as described in Section 112 of the Clean Air Act, but for which new source performance standards (NSPS) exist. Section 111d of the Clean Air Act requires states to control these pollutants. Designated pollutants are acid mist, total reduced sulfur (TRS), and fluorides.

Dip Cleaning - The process in which an object is immersed in a solution containing the solvent and then withdrawn.

Downtime Mode - The time period when the machine is turned off.

Dwell - The period of time when parts are held within the freeboard area of the solvent cleaning machine after cleaning, to allow solvent to drain from the parts back into the machine.

Exempt Compounds - Many district rules exclude these compounds within the definition of "volatile organic compound" because they are not precursors to ozone formation. Excluded compounds are: methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate, methylene chloride, 1,1,1 trichloroethane (methyl chloroform), 1,1,2 trichlorotrifluoroethane (CFC-113), trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), dichlorotetrafluoroethane (CFC-114), chloropentafluoroethane (CFC-115), trifluoromethane (CFC-23), and chlorodifluoromethane (CFC-22).
The SCAQMD and a few other districts specify a separate definition for **exempt compounds** in the text of the prohibitory rule. In calculating the VOC content of a solvent, exempt compounds and water are excluded and are not considered to be part of the solvent. Note: Many exempt compounds may contribute to *upper atmosphere* ozone destruction, and some are being investigated as possible toxic air contaminants.

Explosive Limits - Range of vapor concentrations that will burn in air. A flame will not be sustained at a vapor concentration below the lower explosive limit (LEL) or above the upper explosive limit (UEL).

Flash Point - Temperature at which enough flammable vapors will evaporate from a material to ignite in contact with an open flame or spark.

Floor Sweep - A vapor collection duct designed to capture vapors that are heavier than air and collect along the floor.

Freeboard Height -

Cold Cleaner - The distance from the solvent level to the top of the degreaser.

Vapor Solvent Cleaner - The distance from the solvent/air interface to the top of the degreaser.

Conveyorized Solvent Cleaner - The distance from the solvent level or solvent/air interface to the lowest opening in the degreaser.

Freeboard Ratio: The freeboard height divided by the smaller of the inside length or the inside width dimension of the solvent cleaner.

Freeboard Refrigeration Device (Refrigerated Freeboard Chiller): Any equipment mounted above the condenser equipment which carries a refrigerant to provide a chilled air blanket above the solvent vapor to reduce emissions from a vapor degreaser.

Hand Application Method - Application of solvents by manually held, non-automatic equipment. Such equipment includes paint brush, hand roller, trowel, spatula, dauber, rag, and sponge.

HAP - See hazardous air pollutant.

High Boilers - Solvents with boiling points above 212 degrees F (Tail-end solvents).

GLOSSARY

Hoist - A mechanical device that carries the parts basket and the parts to be cleaned from the loading area, into the solvent cleaning machine, and to the unloading area at a controlled speed. A hoist can be manually operated or can be programmed to cycle parts through the cleaning cycle automatically.

Hood - A partial enclosure or canopy for capturing and exhausting, by means of a draft, the organic vapors or other fumes rising from a process.

Hood Capture Efficiency - The emissions from a process that are captured by the hood and directed into the control device, expressed as a percentage of the total emissions from that process.

Hot Vapor Recycle - A solvent vapor cleaning machine in which parts are cleaned using superheated solvent vapor that is recirculated in the vapor zone.

Hydrocarbon Solvent - A solvent based on VOCs obtained from petroleum and coal tar, and containing only compounds of carbon and hydrogen. Includes aliphatic, aromatic, and napthenic solvents.

Idling Mode - The time period when a solvent cleaning machine is turned on but is not actively cleaning parts.

Initial Boiling Point - The boiling point of a solvent as defined by ASTM D-1078-86.

In-Line or Continuous Cleaning Machine - A cold or vapor solvent cleaning machine that uses an automated parts handling system, typically a conveyor, to provide a continuous supply of parts to be cleaned. These units are fully enclosed except for the conveyor inlet and exit portals.

Leak - Three or more drops of liquid solvent per minute

Leak-Proof Coupling - A threaded or other type of coupling which prevents solvent from leaking while filling or draining from/to the cleaning machine.

Lip Exhaust - A device installed around the top of the opening of a solvent cleaning machine that draws in air and solvent vapor emissions and ducts them away from the solvent cleaning area.

Low Boilers - Solvents with boiling points less than 122 degrees F and usually with high evaporation rates. Sometimes called front-end solvents.

Make-Up Solvent - Solvent added to the solvent cleaning operation to replace solvent lost through evaporation or other means.

Manual Cover - A lid, top, or portal cover for a solvent cleaning machine that is opened and closed by physically lifting, sliding, or pulling it.

Maskant - A coating applied directly to metal parts components to protect surface areas during chemical milling, anodizing, aging, bonding, plating, etching, and/or other chemical surface operations on the component. Maskants usually consist of styrene-butadiene polymer, additives, and a perchloroethylene or toluene solvent base.

Material Safety Data Sheet (MSDS) - Information provided to users by chemical manufacturers, concerning the hazards of specific materials. The format is specified by the federal Occupational Safety and Health Administration (OSHA) in Title 29, Sections 1915-1917, of the Code of Federal Regulations.

Middle Boilers - Solvents with boiling points in the range of 122 to 212 degrees F (Middle Solvent).

Montreal Protocol - An agreement negotiated in 1987 and modified in 1990 by the international community of scientists and environmental leaders. The agreement limits the production and consumption of some chemicals regarded as depleters of the ozone layer in the upper atmosphere and completely phases out some of them by January 1, 2000.

NESHAP - National Emission Standards for Hazardous Air Pollutants.

Non-Photochemically Reactive - Solvents or blends of solvents which do not meet the definition of photochemically reactive in general organic solvent regulations. Not to be confused with exempt compounds, non-precursors, and non-reactive compounds.

Non-Precursor - See Exempt Compounds

Non-Volatile Content - Ingredients of a substance which are left behind after drying on the surface to which the substance has been applied.

GLOSSARY

OSHA - Occupational Safety and Health Administration.

Oxygenated Solvents - VOC which contains oxygen in addition to carbon and hydrogen. Includes alcohols, esters, ketones, and ether-alcohols.

Ozone - An oxygen molecule composed of three oxygen atoms. It is a component of photochemical smog, and its concentration in the air is regulated by pollution control laws. It is a pollutant that meets the criteria of Section 110 of the Clean Air Act.

Photochemically Reactive Solvent (PCR) - Any solvent with an aggregate of more than 20 percent of its total volume composed of the chemicals classified below or which exceeds any of the following individual percentage composition limitations, by total volume of solvent;
(a) A combination of hydrocarbons, alcohols, aldehydes, ethers, esters or ketones having an olefinic or cycloolefinic type of unsaturation, except perchloroethylene; 5 percent;
(b) A combination of aromatic compounds with eight or more carbon atoms per molecule, except ethylbenzene, methyl benzoate and phenyl acetate; 8 percent;
(c) A combination of ethylbenzene, ketones having branched hydrocarbon structures, trichloroethylene, or toluene; 20 percent.

Whenever any organic solvent or any constituent of an organic solvent may be classified from its chemical structure into more than one of the above groups of organic compounds, it shall be considered as a member of the most reactive chemical group--that is, that group having the least allowable percent of the total volume of solvents.

This definition is used in the general organic solvent rules and should not be confused with volatile organic compounds. Most metal parts and products rules do not use this definition, but operations that are exempted from metal parts rules may be subject to the general organic solvent rule. Also, some clean-up, storage, and thinning may be subject to the general organic solvent rule.

Precursor - See Volatile Organic Compound.

Primary Condenser - A series of circumferential cooling coils on a vapor cleaning machine through which a refrigerant is circulated or recirculated to provide continuous condensation of rising solvent vapors, thereby creating a controlled vapor zone which prevents vapors from escaping the machine.

Reactive Organic Compound (ROG) - See Volatile Organic Compound.

Remote Reservoir - A cold cleaner with a tank which is completely enclosed except for a solvent return opening no larger than 100 square centimeters, which allows used solvent to drain into it from a separate solvent sink or work area and which is not accessible for soaking workloads.

Soils - Contaminants to be removed from parts being cleaned. Soils include grease, oils, waxes, metal chips, carbon deposits, fluxes, and tars.

Solvency - The degree to which a solvent holds a substance in solution.

Solvent - A liquid or blend of liquids used to dissolve or disperse a film of soils and which evaporates during drying. The term includes terpenes, hydrocarbons, oxygenated solvents, furans, nitroparaffins, ketones, alcohols, and chlorinated solvents. A "true" solvent is a single liquid which can dissolve soils. Some definitions exclude aqueous cleaning agents.

Solvent/Air Interface - For a vapor cleaning machine, the location of contact between the concentrated solvent vapor layer and the air. For a cold cleaning machine, it is the surface area of the liquid solvent that is exposed to the air.

Solvent Level Control Device - A control device which turns off the sump heater if the solvent level in the degreaser drops below a specified level.

Specific Gravity - Weight of given volume of any substance compared with the weight of an equal volume of water. Relative density.

Spray Booth - An enclosed, ventilated area used for spraying.

Spray Equipment Control Device (Safety Switch) - A control device consisting of a manually reset switch which shuts off the spray pump if the vapor level drops below a specified level.

GLOSSARY

Stripper - A volatile liquid applied to remove soil, maskant for chemical processing, or paints. Most strippers are formulated with methylene chloride, a powerful solvent agent. Methylene chloride has been identified as a toxic air contaminant.

Sump - The part of a solvent cleaning machine where the liquid is located.

Sump Heater Coils The heating system on a vapor cleaning machine which uses steam, electricity, or hot water to boil the liquid solvent.

Sump Heater Control Device - A control device which turns off the sump heater if the solvent temperature rises above a specified level.

Superheated Vapor System - Employing the use of heating coils that boil liquid solvent and generate solvent vapors that are heated to temperatures that are more than 1.5 times greater than the solvent boiling point.

TAC - See toxic air contaminant.

Texture - The structural quality of a surface.

Thinning - Adding volatile liquid to reduce the viscosity of the substance. This liquid may be solvents, diluents, or mixtures of both. Also may be called reducing or "adding make-up solvent."

Threshold Limit Value (TLV) - Maximum allowable airborne concentration of a compound for personnel exposure on a daily basis. TLVs are the concentrations that nearly all workers can breathe for an eight-hour day without harm.

Toxic Air Contaminants (TACs) - Those air pollutants that may cause or contribute to an increase in deaths or serious illness or that may pose a present or future hazard to human health as listed by the Air Resources Board. Potentially toxic air contaminants are also listed as: substances currently under review, scheduled for review, or nominated for review; and those compounds for which health effects information is limited or not yet sufficient to support current review.

Ultrasonics - Enhancement of the cleaning process by agitation of liquid solvents with high frequency sound wave vibrations.

Vapor Solvent Cleaner - Any solvent cleaner that cleans through the condensation of hot solvent vapor on colder workloads.

Vapor Level Control Device (Thermostat/Switch) - A control device, usually equipped with a temperature sensor and manual reset response switch, which turns off the sump heater if the temperature above the air/vapor interface rises above the designed operating level.

Viscosity - The property of a fluid whereby it tends to resist relative motion within itself. A thick liquid such a syrup has a high viscosity. Viscosity is often measured using an efflux type cup which gives the time required for a given quantity of liquid to flow through a hole in the bottom of the metal cup at a given temperature. (See Zahn Cup).

Wipe Cleaning - The removal of dirt and deposits by physically rubbing surfaces with a cloth. Wipe cleaning operations are subject to specific requirements designed to minimize evaporative solvent emissions.

Volatile Organic Compound (VOC) - Any compound of carbon which may be emitted to the atmosphere during the application of and or subsequent drying or curing of coatings, excluding exempt compounds which are defined as methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, metallic carbonates, ammonium carbonate, methylene chloride, 1, 1, 1 trichloroethane (methyl chloroform), 1, 1, 2 trichlorotrifluoroethane (CFC-113), trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), dichlorotetrafluoroethane (CFC-114), chloropentafluoroethane (CFC-115), trifluoromethane (CFC-23), and chlorodifluoromethane (CFC-22) (also see Exempt Compounds). The exact listing of compounds may vary. Some districts use the terms "precursor" or "reactive organic compound" to denote VOC. During the calculation of the VOC content of the coating, these exempt compounds and water are excluded and are not considered to be part of the coating. As a note, many of these compounds which are listed as exempt compounds may contribute to *upper atmosphere* ozone destruction. Other exempt compounds are being investigated as possible toxic air contaminants. Carbon dioxide is a primary pollutant considered to be a "Greenhouse gas" which may contribute to global warming.

GLOSSARY

Volatile Solvent - Any solvent that is not a low volatility solvent.

Volatility - The tendency of a liquid to evaporate. Liquids with high boiling points tend to have low volatility, and vice versa.

Waste Solvent Residue - Material which may contain dirt, oil, metal particles, and/or other waste products concentrated after heat distillation of the waste solvent either in the solvent cleaner itself or after distillation in a separate still.

Water Cover - A layer of water in a batch cold cleaning machine which floats above the denser solvent and provides control of solvent emissions.

Wipe Cleaning - The method of cleaning which utilizes a physical rubbing process to remove contaminants from surfaces.

Working Mode - The time period when the solvent cleaning machine is turned on and is actively cleaning parts.

Workload - The objects put in a cleaner for the purpose of removing oil, grease, soil, coating, dirt or other undesirable matter from the surface of objects.

APPENDICES

A An Executive Summary of Alternative Control Techniques

B Sample Inspection - Checklist \ Procedures

C Samples of District Rules and Permit to Operate

D An Overview of the Department of Toxic Substances Control (DTSC)

E Guidance on Halogenated Solvents NESHAP - A USEPA Report

F National Emission Standards for Hazardous Air Pollutants (NESHAP)

G Fact Sheet, Magnetic Tape Industry

H Extracts from <u>Alternatives to Chlorinated Solvents</u> - An IRTA Report

I District Rules - A Place for Your District's Rules

APPENDIX A

AN EXECUTIVE SUMMARY
OF
ALTERNATIVE CONTROL TECHNIQUES

Extracted from a USEPA report,
Alternative Control Techniques Document—Industrial Cleaning Solvents.

AN EXECUTIVE SUMMARY

OF

ALTERNATIVE CONTROL TECHNIQUES

[Extracted from a USEPA report, Alternative Control Techniques Document--Industrial Cleaning Solvents.]

Congress, in the Clean Air Act Amendments of 1990 (CAAA), supplemented previous mandates regarding control of ozone in nonattainment areas. A new Subpart 2 was added to Part D of Title I. Section 183(c) of the new Subpart 2 provides that:

> ...the Administrator shall issue technical documents which identify alternative controls for all categories of stationary sources of volatile organic compounds ... which emit, or have the potential to emit 25 tons per year or more of such air pollutant.

This report provides, alternative control techniques (ACT) for State and local agencies to consider for incorporating in rules to limit emission of volatile organic compounds (VOC's) that otherwise result from industrial cleaning with organic solvents.

A variety of cleaning solvents are used by industry to remove contaminants such as adhesives, inks, paint, dirt, soil, oil, and grease. Parts, products, tools, machinery, equipment, vessels, floors, walls, and other work areas are cleared for a variety of reasons including housekeeping, safety, operability, and to avoid product contamination. Solvents are used in enormous volumes and a portion of evaporates during use, making cleaning fluids a major source of emissions of VOC. Data collected by EPA show nationwide usage of VOC solvent from only six industries is about 380,000 megagrams per year (Mg/yr) (410,000 tons per year [tons/yr]). Less comprehensive data from other sources suggest total VOC solvent usage for cleaning by all U.S. industry is more than 1 million tons each year.

On average, 25 percent or more of the solvent that was used for cleaning purposes by the six industries (automotive, electrical equipment, metal furniture, photographic supplies, packaging, and magnetic tape) used for the study was lost by spillage or evaporation. This value varied significantly among industries depending on the type of cleaning performed.

The study of the six industries initially tried to quantitatively evaluate sources of evaporative emissions of VOC from solvents used as cleaning agents. The plan was to:

1) examine cleaning "activities" such as wiping, spraying, and dipping to identify the most efficient options and

2) quantify the potential emission reductions and associated costs if use of the more efficient were widely mandated.

This approach was not successful because data to support the necessary level of detail simply was not available. As a result, the Agency was unable to identify baseline emission levels, emission reductions or costs associated with this approach.

Subsequently, information was requested from industry using a different strategy. This time, respondents were asked to provide usage and waste information for objects or processes that had been cleaned rather than on the cleaning "activity". Nearly 300 sets of data sets based on this new approach were collected from the six industries. The responses were closely studied; numerous calls were made to maximize understanding of the information.

The data indicated that all use of solvent for cleaning can be evaluated on the basis of one of only nine general types: cleaning of spray guns, spray booths, equipment, large manufactured components, small manufactured components, floors, tanks, lines and parts. Within each group, however, there is considerable variation, including differences in cleaning techniques, soils removed, solvency, and a likely host of others.

Figure 1-1 [not available here] displays the relative emissions from the nine types of unit operation systems. Somewhat surprisingly, cleaning of spray guns accounted for 50 percent of the total emissions, while most of the remaining were from wiping and spraying the exterior of various parts and equipment. Cleaning tanks and small manufactured components accounted for the least emissions. Equipment cleaning, the most common unit operation, produced only 7 percent of the total emissions.

Although this "unit operation system" approach generated more comprehensible information, the data were still of questionable accuracy for several reasons:

1. Most companies maintained only two types of records; solvents purchased and (as a result of hazardous waste rules) total contaminated solvent released for disposal as hazardous waste.

2. Of the total solvent purchased, only part is used for cleaning purposes; there was little or no information available to quantify how much.

3. Respondees attempted to estimate the desired information, but clearly the requisite details were not available.

4. Further, close review of the data that was submitted revealed that many of the numbers did not balance. The reason was that in many cases the usage estimates were based either on solvent inventories or "guesstimates." Also most plants did not segregate their waste solvent or inadvertently overestimated the solvent in the waste stream by not subtracting the amount of contaminants.

5. There was a large variety in the quantities and ways solvents are used for cleaning, both among and within industries.

6. Communications were difficult and imprecise; all companies did not closely follow the instructions (and vocabulary) that accompanied the questionnaire.

Many industrial facilities' solvent costs, at present, are carried as a plantwide expense item with essentially no records of where or how the materials are used. For example, for accounting purposes, solvents are frequently charged as a plant inventory item (rather than charged against different business centers within the plant). Further, access is often as simple as opening a valve. No accountability is required. Even at plants where the cost of cleaning solvents is charged to various business or cost centers within the plant, usually it is not on a relative usage basis. Instead, the total solvent cost may be assigned to the individual cost centers using some surrogate such as cash flow or number of employees.

Despite the difficulties listed above and general lack of detailed information on cleaning solvent use, the study revealed that a number of companies, for a variety of reasons, had found it in their best interests to reduce the amount of solvent used for cleaning. The reasons varied, cost of disposal of hazardous waste, the cost of solvent, employee exposure and state air pollution rules were factors. Often, a common factor was that management expressed interest and set priorities on learning where and how solvents and other chemicals were consumed. Management concern usually resulted in reduced usage. Simultaneously, reduced usage resulted in lower emissions and costs and also moderated the rate and cost of waste generation.

A key element then, to reducing emissions from use of cleaning solvents is to learn where and how solvents are used. As demonstrated by some plants in the study, this can be done by institution of a solvent accounting system that quantitatively records where cleaning solvent is used. The general consensus of plants that implemented a solvent accounting system is that the resulting benefits and cost savings from changes in cleaning practices or equipment outweigh the costs to implement and maintain the accounting system.

As an alternative to the initial plan to describe specific emission control techniques, this document describes a program that is based on the above findings. The program consists of two main elements; solvent accounting and plant management (or State agency) actions. "Accounting" consists of records of the usage, fate, and cost of cleaning solvents in each business center. While accounting, in and of itself, may not result in reductions, it will identify and allow attention to be placed on the largest uses of solvent and sources of emissions.

Once data are available via the solvent accounting system, plant management and State agencies have a number of options for reducing solvent usage and emissions. The plant management will likely focus on actions that affect usage rates, while the State agencies will emphasize ways to reduce emissions. Example actions are listed in Table 1-1.

TABLE 1-1. EXAMPLES OF SOLVENT MANAGEMENT ACTIONS

Plant management actions	State agency actions
1. Collect data on a UOS basis in cost centers where high costs have been identified.	1. Require plants to consider accounting on a UOS level if cost center data cannot be compared among plants.
2. Compare usage between two like cost centers or UOS's and require action by larger user.	2. Require plants to submit individual solvent reduction plans.
3. Provide incentives and goals to similar cost centers.	3. Compare solvent usage from like UOS's within a given industry and require justification from higher users.
4. Evaluate potential alternative cleaning solutions.	4. Mandate implementation of specific solvent management techniques.
5. Conduct experiments to determine minimum amount needed for each cleaning task.	5. Require plants to conduct extensive, short-term studies and to commit to take action based on results.
6. Implement an employee suggestion program.	6. Compile and share information on the use of cleaning solutions. Mandate use where appropriate.
7. Form a task force with other plant managers to compare cleaning practices.	7. Compile and share results of alternative cleaning solution tests. Mandate use where appropriate.

One widely applicable action is to search for alternative cleaning materials that would release less VOC's to the atmosphere. Avenues for success include use of either aqueous cleaning fluids or organic cleaning solvents that evaporate more slowly.

Plants with many cleaning activities, or with many unit operations, in each cost center may find the cost center level is too large to allow identification of the major emission sources in order to initiate steps to reduce solvent emissions. In that case, data must be assembled on a more focused basis. A particularly helpful concept is to collect data on a "unit operation system" (UOS) basis[1]. A UOS is defined in this study as an ensemble around which a material balance for cleaning can be performed. Such a material balance aids detailed quantitative evaluations of usage and emissions of solvent. The boundaries of a UOS should be selected to include all possible points/sources leading to evaporative emission losses associated with cleaning a specific unit operation, including losses during dispensing the solvent, spilling virgin and used solvent, handling residual solvent in cleaning applicators, etc. The UOS approach is described in Appendix C.

Detailed accounting of data on the input and output streams for a UOS should result in the best chance to identify areas with the greatest emission, usage, or waste reduction potential. The more specific and better defined the UOS, the better the analysis will be. Implementing the UOS approach or taking other actions like those on Table 1-1 will ultimately lead to implementation of emission reduction techniques.

In short, the first step in reducing emissions from use of cleaning solvents is to identify those locations within the plant boundaries where the cleaning solvents are used--and lost--in the greatest quantity. This can be accomplished by requiring companies to institute accounting procedures to track the use and emissions from different places within the plant that use cleaning solvents.

The second step is to use the knowledge obtained from the accounting system. Specific actions may be initiated by plant management or specified by the State Agency. The accounting system provides a quantitative measure of the results of corrective actions and helps guard against subsequent regression to former working conditions.

The automobile industry has suggested an alternative approach (Appendix D), [not included here] use of short term intensive studies to identify methods for reducing emissions from solvent use. This would obviously be a positive activity, worthy of encouragement by the State, and perhaps equally effective over the near term. Some subsequent tracking steps would appear necessary to assure that the initial success is not subsequently lost.

1. Memorandum from Wyatt,S ., EPA, to project file. February 24, 1994. "Unit Operation System" - Originator of Concept.

SAMPLE
INSPECTION
CHECKLISTS / PROCEDURES
AND LABELS

INDUSTRY SELF-INSPECTION CHECKLISTS

(Samples, From Which To Develop Your Own)

One included sample self-inspection checklist is taken from the Solvents Self-Inspection Handbook, which is available from the ARB Compliance Division /CAP for distribution to facilities using solvents. For copies of the Self-Inspection Handbook, please contact an appropriate office within your agency or personnel of the Compliance Assistance Program at (916) 327-7211 or fax (916) 445-5745.

AIR RESOURCES BOARD
COMPLIANCE DIVISION

Solvent Cleaners
Facility Inspection Form

General Information

ARB Inspector: ____________________ Date/Time: ____________
APCD Inspector: ____________________ APCD: ____________
Name of Facility: ____________________ Phone: ( ) ____________
Address: ________________________________
Company Representative: ____________________ Title: ____________
Permit No: ____________ Permit Conditions: ____________
____
Type of Cleaner: Cold ____________, Vapor ____________, Conv. ____________
Solvents Used: ____________________ Exempt: ____________
Length: ____________, Width: ____________, Open Surface Square Feet: ____________

* * *

Equipment Requirements

Container: ____________, Cover: ____________, Drag Out Drain: ____________

COLD

1. Freeboard Ratio of 0.75 or Greater: ____________________, or
   Water Cover if Applicable: ____________________ (Needs Determination), or
   Other Equivalent Control: ____________________ (Needs Determination), or
   Exempt if facility demonstrates that VOC vapor pressure is = or < 0.6 psia <u>and</u> F/B Ratio is .5 or more: ____________________ (Needs Determination).

* * *

VAPOR

1. High Vapor Cutoff Thermostat w/Manual Reset: ____________________, and
2. Freeboard Ratio of 0.75 or Greater: ____________________, or
   for Perc. a Refrigerated Chiller, Water Jacket or Condensing Coils: ____________________ (State Which One), and
3. Cleaners with more than 10.8 Square Feet of Open Surface Area:
   Refrigerated Chiller: ____________________, Temp: ____________, or
   Carbon Adsorption: ____________________, Efficiency: ____________, or
   Other: ____________________ (Needs Determination), or
   Exempt if Equipped w/Refrigerated Condensers <u>and</u> Temp. is 55F or Less: ____________ (Needs Determination), or Perc.: ____________.

* * *

CONVEYORIZED

1. High Vapor Cutoff Thermostat w/Manual Reset: ____________________, and
2. Freeboard Ratio of 0.75 or Greater: ____________________, or
   For Perc. a Refrigerated Chiller, Water Jacket or Condensing Coils: ____________________ (State Which One), and
3. Cleaners With More Than 10.8 Square Feet of Open Surface Area:
   Refrigerated Chiller: ____________________, Temp.: ____________, or
   Carbon Adsorption: ____________________, Efficiency: ____________, or
   Other: ____________________ (Needs Determination)
   Exempt if Equipped w/Refrigerated Condensers <u>and</u> Temp. is 55F or Less: ____________ (Needs Determination), or Perc.: ____________, and
4. Hood Enclosure: ____________________, or Approved Equipment: ____________
   Exempt if < 21.6 Square Feet of Air Interface: ____________________, and
5. Drying Tunnel ____________________, or Other: ____________________, and
6. Entrances and Exits 10cm or Less Than 10% of Width: ____________________.

July 1995

/95Operating Requirements

COLD

1. Clean Parts Drained: ____, and
2. Remote Reservoir Cleaner Drainage Tank Cover: __________________________, and
3. Remote Reservoir Cleaner Drafts: ____________________(Needs Determination).

****

VAPOR

1. Lip Exhaust Off When Covered: ________________________________, and
2. Start Up and Shutdown - Freeboard Chiller Turned On Before ________________, and
   Off After ______________ the Sump Heater, and
3. Solvent Flow (No Spray, etc.) Cleaning Within Vapor Zone: ________________, and
4. Work Load in Vapor Zone: ______________________________________.

****

ALL

1. No Solvent Leaks: ____, and
2. Proper Solvent Storage: ____________________________________, and
3. Proper Solvent Waste Storage: ________________________________, and
4. Distilled Residue < 20% VOC: ____________________(Needs Determination), and
5. Anti-Evaporation Cover: ____________________________________, and
6. Liquid Stream Cleaning: _____________________________________, or
   85% Reduction Before Venting: ____________________(Needs Determination), and
7. Solvent Agitation By Recirculation, Mixer, or Ultrasonics: ________________
   (State Which One), or Air Flow Agitation only if = < 2 psi <u>and</u> Cover Closed During Agitation:
   ____(Needs Determination), and
8. Vertical Speed of Power Hoist or Conveyor not more than 11.2 ft/min:
   ____(Needs Determination).

Violations

____
____
____

Comments

____
____
____
____
____
____
____
____
____

Signatures

APCD Inspector: ____
ARB Inspector: ____
Other: ____

SOLVENT CLEANING DEGREASING OPERATIONS
SELF-INSPECTION CHECKLIST

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Good Working Order							
Switches & Gauges Work Properly							
No Liquid Leaks							
Closed Cover is Tight							
No Air or Atomized Solvent Spray							
No Splashing							
Parts Racked to Prevent Pooling							
Parts Dry Before Removal							
No Porous Materials							
Freeboard Ratio >0.75							
Hoist Speed <11 feet/minute							
Closed Solvent Containers							
Cover Closed if Not in Use							
Lip Exhaust Off When Covered							
Proper Solvent Disposal							

Week Ending: ____________

July 1995

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

ENFORCEMENT DIVISION
INSPECTION CHECKLIST
FEE CODE 28B - COLD SOLVENT DEGREASER

Company Name (dba): ______________________ ID #: __________
Equipment Address: ______________________
Company Representative: ______________________ Title: __________
Phone: ______________
Permit #: __________ Expiration Date: __________

Equipment Description:

Make: ______________ Model: __________ Capacity: ________
Internal size of tank: ______" L X ______" W X ______" H
S/Ns: ______________ Other: ______________

1. Permit posted i.c.w. Rule 10(c)? ☐ Yes ☐ No ☐ N/A
2. Operating i.c.w. permit conditions? ☐ Yes ☐ No ☐ N/A
3. Solvent type used: ______________
   Annual Usage: ______ gal/yr Daily Usage: ______ gal/day
4. Vapor pressure > 0.6 psia at 38° C.? ☐ Yes ☐ No ☐ N/A
   Operating i.c.w. Rule 67.6(d)(2)? ☐ Yes ☐ No ☐ N/A
5. Solvent disposal method: ______________
   Qty sent to disposal: ______ gal/yr. Qty sent to reclaimer: ______ gal/yr.
6. Tank covered? ☐ Yes ☐ No ☐ N/A
7. Equipped with parts draining facility? ☐ Yes ☐ No ☐ N/A
8. Operating i.c.w. Rule 67.6(d)(5)? ☐ Yes ☐ No ☐ N/A
9. Freeboard ratio: __________
10. Maximum solvent mark? ☐ Yes ☐ No ☐ N/A
11. Conspicuous operating requirements label? ☐ Yes ☐ No ☐ N/A
12. Solvent flow system used? ☐ Yes ☐ No ☐ N/A
    ☐ Steady Stream ☐ Shower Spray (N/V) ☐ Atomized (N/V)
13. Solvent agitation? ☐ Yes ☐ No ☐ N/A
    ☐ Mixer ☐ Pump Recirculation ☐ Air Agitation (N/V)
14. Notice to Comply Issued? ☐ Yes ☐ No ☐ N/A
15. Notice of Violation Issued? ☐ Yes ☐ No ☐ N/A
    Rule(s): __________

Remarks: ______________________________
____
____

Inspector's Signature: ______________________ Date: __________

Rev. 6/93

Draft

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

COMPLIANCE DIVISION
INSPECTION CHECKLIST
FEE CODE 28F/28K - REMOTE RESERVOIR UNITS/ CONTRACT SERVICE REMOTE RESERVOIR UNITS (SAFETY KLEEN)

Date of Inspection: ____________

Company Name (dba): ____________

Company Representative: ____________ Title: ____________

Operator (If unit is a contract service unit i.e., Safety Kleen): ____________

ID #: ________ Permit #: ________ Expiration Date: ________

EQUIPMENT DESCRIPTION: Same as P/O ☐ Yes ☐ No

If no, are changes i.c.w 10(a)/10(b) ☐ Yes ☐ No *(Explain Below)*

1. Permit Posted i.c.w. Rule 10(c)? ☐ Yes ☐ No
2. Operating i.c.w. Permit Conditions? ☐ Yes ☐ No
3. Solvent Type Used: ____________
4. Records Kept? ☐ Yes ☐ No
5. Solvent Amount Added: ________ Solvent Amount Removed: ________
6. Solvent Disposal Method: ________ Quantity Sent to Disposal: ________
7. Equipped with a Tank Cover? ☐ Yes ☐ No
8. Tank Covered When Not in Use or Processing Work? ☐ Yes ☐ No
9. Is the Equipment Leaking? ☐ Yes ☐ No
   If yes, Where? ____________
10. Is Equipment Located in a Drafty Area? (>131 feet/minute) ☐ Yes ☐ No
11. Operating Instructions Posted per 67.6(d)(5)? ☐ Yes ☐ No
12. Solvent Flow System:
    ☐ Steady Stream ☐ Shower Spray (N/V) ☐ Atomized (N/V)
13. Notice to Comply Issued? Rule(s)______ ☐ Yes ☐ No NTC #________
14. Notice of Violation Issued? Rule(s)______ ☐ Yes ☐ No NOV #________

Remarks: ____________

____

____

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____

____

____

Inspector's Signature: ____________ Date: ________

Rev. 9/1/94

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

COMPLIANCE DIVISION
INSPECTION CHECKLIST
FEE CODE 27 - GRAPHIC ARTS OPERATIONS

Date of Inspection:_______________

Company Name (dba): ____

Company Representative: ________________________ Title: _______________

ID #: __________ Permit #: ____________ Expiration Date: _____________

EQUIPMENT DESCRIPTION: Same as P/O ☐ Yes ☐ No

If no, are changes i.c.w 10(a)/10(b) ☐ Yes ☐ No (*Explain Below*)

1. Permit Posted i.c.w. Rule 10(c)? ☐ Yes ☐ No
2. Operating i.c.w. Permit Conditions? ☐ Yes ☐ No ☐ N/A
3. Type of printing process: ☐ Web-fed ☐ Screen printing ☐ Single sheet fed ☐ Lithographic printing ☐ Gravure/RotoGravure Printing ☐ Flexographic printing ☐ Lamination
4. VOC content of inks/coatings < 2.5 lbs/gal (300 g/l) ☐ Yes ☐ No
5. Type of Inks: ☐ Heatset ☐ Non-Heatset ☐ Other
6. Fountain Solutions < 15% by volume VOC? ☐ Yes ☐ No
7. Cleanup materials:
   a. VOC content < 200 g/l ☐ Yes ☐ No
   b. Vapor pressure < 45mm Hg ☐ Yes ☐ No
8. VOC materials in closed containers? ☐ Yes ☐ No
9. Recordkeeping requirements met? ☐ Yes ☐ No
10. Control equipment operating? ☐ Yes ☐ No ☐ N/A
11. Operating i.c.w. Rule 51? ☐ Yes ☐ No
12. Notice to Comply issued rule(s)____________ ☐ Yes ☐ No NTC#__________
13. Notice of Violation issued rule(s)____________ ☐ Yes ☐ No NOV#__________

Remarks:____

____

____

____

____

____

____

Inspector's Signature: ______________________________ Date: __________

SAN DIEGO AIR POLLUTION CONTROL DISTRICT

ENFORCEMENT DIVISION
INSPECTION CHECKLIST
FEE CODE 27 - SURFACE COATING APPLICATIONS

Company Name (dba): ________________________ ID #: ________
Equipment Address: ____
Company Representative: ____________________ Title: ____________
Phone: ______________
Permit #: __________ Expiration Date: __________

Equipment Description:
Make: __________________ Model: __________ Capacity: ________
S/Ns: __________________ Other: ______________________

1. Permit posted i.c.w. Rule 10(c)? ☐ Yes ☐ No ☐ N/A
2. Operating i.c.w. permit conditions? ☐ Yes ☐ No ☐ N/A
3. Substrate: ____________________
4. Coating and Solvent Usage:
   Combined Maximum: ______ gal/day ______ lb/day
   Combined Average: ______ gal/day ______ lb/day
5. Is oven included? ☐ Yes ☐ No ☐ N/A
   Type of Oven Used: ____________________
   Baking Temperature: ________ ° F. Baking Time: ______ Min.
6. Coatings/Solvents same as those on list? ☐ Yes ☐ No ☐ N/A
7. VOC materials in closed containers? ☐ Yes ☐ No ☐ N/A
8. Is application method compliant? ☐ Yes ☐ No ☐ N/A
   Method of application: ____________________________
9. Are all VOC materials compliant? ☐ Yes ☐ No ☐ N/A
10. Is clean-up method compliant? ☐ Yes ☐ No ☐ N/A
11. Recordkeeping requirements met? ☐ Yes ☐ No ☐ N/A
12. Control equipment operating? ☐ Yes ☐ No ☐ N/A
13. Operating i.c.w. Rule 51? ☐ Yes ☐ No ☐ N/A
14. Notice to Comply Issued? ☐ Yes ☐ No ☐ N/A
15. Notice of Violation Issued? ☐ Yes ☐ No ☐ N/A
    Rule(s): __________
16. Subject to Rule 260.310 or 260.450? ☐ Yes ☐ No ☐ N/A

Remarks: ____
____
____

Inspector's Signature: ________________________ Date: __________

FEE CODE 27 - SURFACE COATING APPLICATIONS

Material Category*	Manufacturer	ID #	Mix Ratio	VOC Content	VOC as applied	VOC Std.	Usage

* Category for VOC content in specific rule (i.e. primer, thinner, catalyst, stripper, cleanup solvent, surface prep, etc.)

PROPER D.O.T. SHIPPING NAME

HAZARDOUS WASTE

GENERATOR INFORMATION:
ACCOUNT NO.
NAME
ADDRESS
ADDRESS
CITY/STATE
USA EPA ID NO.
STATE EPA ID NO.
ACCUMULATION START DATE
MANIFEST DOCUMENT NO.
GENERATOR STORAGE DATE ____________
TRANSFER START DATE ____________
TSDF STORAGE DATE ____________

CONTAINER NO.	USE LABEL BY

SK82309 (3/95)

(SERVICE DOCUMENT)

CONT #
SK DOT #
MANF #
GEN
DOC #
EXPIRES
ACTUAL WT/GAL.

(PALLET)

ACTUAL WT/GAL.

PROPER D.O.T. SHIPPING NAME
RQ WASTE COMPOUNDS, CLEANING LIQUID
(MONOETHANOLAMINE) CLASS 8 NA1760 PG III
(EPA: D008,D006,D007,D018,D021,D027,D039,D040)
***** TOXIC *****

LIQUID

HAZARDOUS WASTE

STATE AND FEDERAL LAW
PROHIBITS IMPROPER DISPOSAL.
IF FOUND, CONTACT THE NEAREST POLICE, OR
PUBLIC SAFETY AUTHORITY, OR THE
U.S. ENVIRONMENTAL PROTECTION AGENCY
OR THE CALIFORNIA
DEPARTMENT OF TOXIC SUBSTANCES CONTROL.

GENERATOR INFORMATION:
ACCOUNT NO. 7-088-06
NAME
ADDRESS
ADDRESS
CITY/STATE
USA EPA ID NO.
STATE EPA ID NO.
ACCUMULATION START DATE
MANIFEST DOCUMENT NO.
TRANSFER START DATE ____________
TSDF STORAGE DATE ____________

CONTAINER NO.	USE LABEL BY
BR	

CONTAINER NO. BR
DOCUMENT NO.
S/K DOT 0000566
GENERATOR 7-088-06
00722

ACTUAL WT/GAL.
MANIFEST DOC. NO.
EXPIRES
708806

SK82304 (7/92)

Close cover when unit is not in use.

SK81449

State of California—Environmental Protection Agency
Form Approved OMB No. 2050-0039 (Expires 9-30-96)
Please print or type. *Form designed for use on elite (12-pitch) typewriter.*

7-172-01

See Instructions on back of page 6.

Department of Toxic Substances Control
Sacramento, California

IN CASE OF EMERGENCY OR SPILL, CALL THE NATIONAL RESPONSE CENTER 1-800-424-8802; WITHIN CALIFORNIA, CALL 1-800-852-7550

95817083

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. ILD 984908202 Manifest Document No. 94723
2. Page 1 of 1

Information in the shaded areas is not required by Federal law.

GENERATOR

3. Generator's Name and Mailing Address SAFETY-KLEEN CORP.
1000 N. RANDALL ROAD
ELGIN IL 60123
4. Generator's Phone (800 669-5740

A. State Manifest Document Number 95817083
B. State Generator's ID HYHQ36009069

5. Transporter 1 Company Name SAFETY-KLEEN CORP.
6. US EPA ID Number ILD 984908202

C. State Transporter's ID
D. Transporter's Phone 800 669-5740

7. Transporter 2 Company Name
8. US EPA ID Number

E. State Transporter's ID
F. Transporter's Phone

9. Designated Facility Name and Site Address 717201
SAFETY-KLEEN CORP.
7979 PALM AVE-UNIT A
HIGHLAND, CA 92346
10. US EPA ID Number CAT 000613927

G. State Facility's ID CAT000613927
H. Facility's Phone 714 862-8300

11. US DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste Number
a. WASTE COMPOUNDS, CLEANING LIQUID (MONOETHANOLAMINE)8 NA1760 PGIII(ERG#60) (D006, D008, D018, D021, D027, D035, D039D040)		DM		G	State 741 EPA/Other D006
b.					State EPA/Other
c.					State EPA/Other
d.					State EPA/Other

J. Additional Descriptions for Materials Listed Above
(A) D008 D018 (A) D021 D027 D035 D039 D040

K. Handling Codes for Wastes Listed Above
a. 14/01
b.
c.
d.

15. Special Handling Instructions and Additional Information 88264387 999999 7-172-01
EMERGENCY RESP# 1-708-888-4660 (24 HR)
TRUCK PER DAY

SKDOT# A: 566 B: C: D:

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name | Signature | Month Day Year

TRANSPORTER

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Month Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name | Signature | Month Day Year

DO NOT WRITE BELOW THIS LINE.

CA00321

DTSC 8022A (1/95)
EPA 8700—22

White: TSDF SENDS THIS COPY TO DTSC WITHIN 30 DAYS.
To: P.O. Box 3000, Sacramento, CA 95812

IMPORTANT INFORMATION

Read and become familiar with the Material Safety Data Sheet for Safety-Kleen 105/140 Solvent. Additional copies are available from your Safety-Kleen representative.

⚠WARNING **COMBUSTIBLE LIQUID VAPOR HARMFUL**
KEEP OUT OF REACH OF CHILDREN

SAFE USE INSTRUCTIONS

1. **COMBUSTIBLE LIQUID. Keep away from heat, sparks, and flame.** Do not place hot parts in solvent.
2. **VAPOR HARMFUL.** Use only in well ventilated locations. Avoid repeated and/or prolonged breathing of vapors.
3. Use of compressed air to dry parts may cause a high concentration of solvent vapors. Use local exhaust ventilation in areas of high vapor concentration.
4. Do not clean or degrease porous or absorbent materials.
5. Do not use solvent on friction materials such as brake linings and clutch surfaces that are to be reused.
6. Drain cleaned parts in the parts cleaner until dripping ceases.
7. Wipe rubber and metal brake parts completely dry before reassembly.
8. Use only solvent provided. Do not add other chemicals to the cleaning solvent, including, but not limited to, kerosene, fuel oil, gasoline, detergents, or chlorinated solvents. The use of any other solvents potentially causes a hazardous condition over which Safety-Kleen has no control.
9. Avoid contact with eyes.
10. Avoid repeated and/or prolonged contact with skin. Wear protective gloves and clothing.
11. Do not smoke, eat, or drink in the work area.

HEALTH HAZARD WARNINGS

Safety-Kleen 105/140 Parts Washing Solvent contains:
mineral spirits (CAS 64741-41-9 or 64742-88-7).

1. **Eyes:** Contact may cause slight to moderate irritation. High vapor concentrations (greater than 500 ppm) are irritating to the eyes.
2. **Skin:** Prolonged or repeated contact tends to remove skin oils, possibly leading to irritation and dermatitis. No significant skin absorption hazard.
3. **Inhalation:** High concentrations of vapor or mist may be irritating to the respiratory tract, cause headaches, dizziness, nausea, impaired coordination, anesthesia and may have other central nervous system effects.
4. **Ingestion (Swallowing):** Low order of acute oral toxicity. May cause irritation of the throat, nausea, vomiting, and symptoms of central nervous system depression. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

FIRST AID

1. **Eyes:** For direct contact, flush eyes with water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation or pain persists. If irritation or redness from exposure to vapors or mists develops, move victim away from exposure into fresh air.
2. **Skin:** Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.
3. **Inhalation:** Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.
4. **Ingestion (Swallowing):** If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

ENVIRONMENTAL

1. Operation should be conducted in manner which prevents spillage. Any spillage should be promptly and properly cleaned up.
2. Contain solvent leaks and notify Safety-Kleen immediately, as well as your local environmental regulatory agency if required.
3. Proper housekeeping in the area of the parts cleaner is the responsibility of the user.
4. There may be additional hazardous materials compliance requirements. Check with your local jurisdiction to determine what regulations are associated with operation of the parts cleaner.

Emergency Response #27
U.S. D.O.T. Petroleum Naphtha. Combustible Liquid UN 1255

For further information, see MSDS for Safety-Kleen 105/140 Parts Washing Solvent, or call:

Safety-Kleen Corp.	**1-800-669-5740**
For Emergency Medical Assistance call:	
Rush Poison Control Center	**1-800-752-7869**

LISTED RENOVATED PARTS CLEANER 660N. FOR USE ONLY WITH METAL PARTS CLEANING SOLVENTS CLASSIFIED BY UNDERWRITERS LABORATORIES INC. IN THE RANGE 30-40 OR LESS, WITH A FLASH POINT NOT LESS THAN 100°F. THE PHYSIOLOGICAL EFFECTS OF THIS SOLVENT, IN ANY FORM, HAVE NOT BEEN INVESTIGATED BY UNDERWRITERS LABORATORIES INC. AND ARE NOT COVERED BY THE LISTING.

DO NOT ADD ANY WATER,
SOLVENTS, OR OTHER
CHEMICALS TO THIS MACHINE.

SK81293

IMPORTANT INFORMATION

Read and become familiar with the Safety-Kleen Parts Cleaner booklet #1343, and Material Safety Data Sheets. Additional copies are available from your Safety-Kleen representative.

⚠WARNING **COMBUSTIBLE LIQUID VAPOR HARMFUL**
KEEP OUT OF REACH OF CHILDREN

SAFE USE INSTRUCTIONS

1. **COMBUSTIBLE LIQUID. Keep away from heat, sparks, and flame.** Do not place hot parts in solvent.
2. **VAPOR HARMFUL.** Use only in well ventilated locations. Avoid repeated and/or prolonged breathing of vapors.
3. Use of compressed air to dry parts may cause a high concentration of solvent vapors. Use local exhaust ventilation in areas of high vapor concentration.
4. Do not clean or degrease porous or absorbent materials.
5. Do not use solvents on friction materials such as brake linings and clutch surfaces that are to be reused.
6. Wipe rubber and metal brake parts completely dry before reassembly.
7. Use only solvent provided. Do not add other chemicals to the cleaning solvent, including, but not limited to, kerosene, fuel oil, gasoline, detergents, or chlorinated solvents. The use of any other solvents cancels the machine warranty and potentially causes a hazardous condition over which Safety-Kleen has no control.
8. Do not smoke, eat, or drink in the work area.
9. Avoid contact with eyes.
10. Avoid repeated and/or prolonged contact with skin. Wear protective gloves and clothing.
11. Drain cleaned parts in the parts cleaner until dripping ceases.
12. Do not obstruct or hang anything on cover. Obstructions prevent the cover from closing in the event of fire.
13. Do not modify this machine.
14. Do not replace fusible link with any other device to hold lid up. If fusible link should break, contact your Safety-Kleen representative immediately.
15. Where lamp is provided, do not use light bulb rated over 40 watts.
16. Do not allow unit to operate unattended.

HEALTH HAZARD WARNINGS

Safety-Kleen 105/140 Parts Washing Solvent contains:
mineral spirits (CAS 64741-41-9 or 64742-88-7).

1. **Eyes:** Contact may cause slight to moderate irritation. High vapor concentrations (greater than 500 ppm) are irritating to the eyes.
2. **Skin:** Prolonged or repeated contact tends to remove skin oils, possibly leading to irritation and dermatitis. No significant skin absorption hazard.
3. **Inhalation:** High concentrations of vapor or mist may be irritating to the respiratory tract, cause headaches, dizziness, nausea, impaired coordination, anesthesia and may have other central nervous system effects.
4. **Ingestion:** Low order of acute oral toxicity. May cause irritation of the throat, nausea, vomiting, and symptoms of central nervous system depression. Aspiration into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

FIRST AID

1. **Eyes:** For direct contact, flush eyes with water for 15 minutes lifting upper and lower lids occasionally. Consult physician if irritation or pain persists. If irritation or redness from exposure to vapors or mists develops, move victim away from exposure into fresh air.
2. **Skin:** Remove contaminated clothing. Wash skin twice with soap and water. If irritation develops and persists, consult a physician.
3. **Inhalation:** Remove to fresh air immediately. Use oxygen if there is difficulty breathing or artificial respiration if respiration has stopped. Do not leave victim unattended. Seek immediate medical attention if necessary.
4. **Ingestion:** If conscious, dilute with 4 to 8 ounces of water and seek immediate medical attention. DO NOT induce vomiting.

ENVIRONMENTAL

1. Operation should be conducted in a manner which prevents spillage. Any spillage should be promptly and properly cleaned up.
2. Contain solvent leaks and notify Safety-Kleen immediately, as well as your local environmental regulatory agency if required.
3. Proper housekeeping in the area of the parts cleaner is the responsibility of the user.
4. There may be additional hazardous materials compliance requirements. Check with your local jurisdiction to determine what regulations are associated with operation of the parts cleaner.

Emergency Response #27
U.S. D.O.T. Petroleum Naphtha. Combustible Liquid UN 1255

For further information, see MSDS for Safety-Kleen 105/140 Parts Washing Solvent, or call:

Safety-Kleen Corp. 1-800-669-5740
For Emergency Medical Assistance call:
Rush Poison Control Center 1-800-752-7869

OWNER:

This parts cleaner is the property of Safety-Kleen Corp., New Berlin, WI 53151.

SERVICE/REPAIRS:

This parts cleaner is to be serviced only by authorized Safety-Kleen personnel using approved Safety-Kleen solvent. If you have any questions, require repairs, or need early service, call the phone number provided.

CAUTION
AVOID DAMAGE
DO NOT SOAK PARTS OVER
ONE HOUR WITHOUT INSPECTING
SK2413

APPENDIX C

Samples of District Rules and Permit to Operate

Although these documents may appear to be current and valid, they are placed here as **samples only**.

[SCAQMD]

(Adopted August 2, 1991)

RULE 1171. SOLVENT CLEANING OPERATIONS

(a) Purpose and Applicability

The purpose of this rule is to reduce emissions of volatile organic compounds (VOC) and stratospheric ozone-depleting or global-warming compounds from solvent cleaning operations, and from the storage and disposal of these materials used in solvent cleaning operations.

This rule applies to all persons who engage in the production, repair, maintenance, or servicing of parts, products, tools, machinery, equipment, or general work areas, and to all persons who store and dispose of VOC-containing materials used in solvent cleaning operations.

(b) Definitions

For the purpose of this rule, the following definitions shall apply:

(1) AEROSOL PRODUCT is a hand-held, nonrefillable container which expels pressurized product ingredients by means of a propellant-induced force.

(2) APPLICATION LINE is that portion of a motor vehicle assembly production line which applies surface and other coatings to motor vehicle bodies, hoods, fenders, cargo boxes, doors, and grill opening panels.

(3) APPURTENANCES are accessories to an architectural structure, including, but not limited to: hand railings, cabinets, bathroom and kitchen fixtures, fences, rain-gutters and down-spouts, window screens, lamp-posts, (heating and air conditioning) equipment, other mechanical equipment, large fixed stationary tools and concrete forms.

(4) ARCHITECTURAL COATINGS are any coatings applied to stationary structures and their appurtenances, to mobile homes, to pavements, or to curbs.

(5) CURED COATINGS, CURED INKS, AND CURED ADHESIVES are coatings, inks, and adhesives which are dry to the touch.

(6) ELECTRONIC ASSEMBLY means all portions of an assembly, including circuit card assemblies, printed wire assemblies, printing wiring

boards, soldered joints, ground wires, bus bars, and other electrical fixtures, except for the actual cabinet in which the assembly is housed.

(7) EXEMPT COMPOUNDS are any of the following compounds:

(A) Group I

trifluoromethane (HFC-23)
chlorodifluoromethane (HCFC-22)
dichlorotrifluoroethane (HCFC-123)
tetrafluoroethane (HFC-134a)
dichlorofluoroethane (HCFC-141b)
chlorodifluoroethane (HCFC-142b)
1,1,1-trifluoroethane (HFC-143a)
1,1-difluoroethane (HFC-152a)
cyclic, branched, or linear, completely fluorinated alkanes
cyclic, branched, or linear, completely fluorinated ethers with no unsaturations
cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations
sulfur-containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine

(B) Group II

methylene chloride
carbon tetrachloride
1,1,1-trichloroethane (methyl chloroform)
trichlorotrifluoroethane (CFC-113)
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
dichlorotetrafluoroethane (CFC-114)
chloropentafluoroethane (CFC-115)

(8) FACILITY means a business or businesses engaged in solvent cleaning operations which are owned or operated by the same person or persons and are located on the same or contiguous parcels.

(9) FLEXOGRAPHIC PRINTING is a letterpress method utilizing flexible rubber or other elastomeric plate and rapid drying liquid inks.

(10) GRAMS OF VOC PER LITER OF MATERIAL is the weight of VOC per volume of material and can be calculated by the following equation:

$$\text{Grams of VOC per liter of material} = \frac{W_s - W_w - W_{es}}{V_m}$$

Where: W_s = Weight of volatile compounds in grams
W_w = Weight of water in grams
W_{es} = Weight of exempt compounds in grams
V_m = Volume of material in liters

(11) GRAPHIC ARTS are all screen, gravure, letterpress, flexographic, and lithographic printing processes.

(12) GRAVURE PRINTING is an intaglio process in which the ink is carried in minute etched or engraved wells on a roll or cylinder. The excess ink is removed from the surface by a doctor blade.

(13) JANITORIAL CLEANING is the cleaning of building or facility components, such as the floor, ceiling, walls, windows, doors, stairs, bathrooms, etc.

(14) LETTERPRESS PRINTING is the method in which the image area is raised relative to the nonimage area and the ink is transferred to the paper directly from the image surface.

(15) LITHOGRAPHIC PRINTING is a plane-o-graphic method in which the image and nonimage areas are on the same plane.

(16) LIQUID LEAK is the visible liquid solvent leak from the container at a rate of more than three (3) drops per minute, or a visible liquid mist.

(17) MAINTENANCE CLEANING is a solvent cleaning operation carried out to keep parts, products, tools, machinery, equipment, or general work areas in clean and good operational condition.

(18) MANUFACTURING PROCESS is the process of making goods or articles by hand or by machinery.

(19) NON-ABSORBENT CONTAINERS are containers made of nonporous material which do not allow the migration of the liquid solvent through them.

(20) NON-ATOMIZED SOLVENT FLOW is the use of a solvent to remove uncured adhesives, uncured inks, uncured coatings, and contaminants from an article in the form of a liquid stream without atomization.

(21) NON-LEAKING CONTAINERS are containers without liquid leaks.

(22) PERSON is any firm, business establishment, association, partnership, corporation or individual, whether acting as principal, agent, employee,

or other capacity including any governmental entity or charitable organization.

(23) PRINTING in the graphic arts is any operation that imparts color, design, alphabet, or numerals on a substrate.

(24) REMOTE RESERVOIR COLD CLEANER is a cleaning device in which liquid solvent is pumped from a solvent container to a sink-like work area and the solvent from the sink-like area drains into an enclosed solvent container while parts are being cleaned.

(25) REPAIR CLEANING is a solvent cleaning operation carried out during a repair process.

(26) REPAIR PROCESS is the process of returning a damaged object or an object not operating properly to good condition.

(27) SCREEN PRINTING is a process in which the printing ink passes through a web or a fabric to which a refined form of stencil has been applied. The stencil openings determine the form and dimensions of the imprint.

(28) SOLVENT is a VOC-containing liquid used to perform solvent cleaning operations.

(29) SOLVENT CLEANING OPERATION is the removal of loosely held uncured adhesives, uncured inks, uncured coatings, and contaminants which include, but are not limited to, dirt, soil, and grease from parts, products, tools, machinery, equipment, and general work areas. Each distinct method of cleaning in a cleaning process which consists of a series of cleaning methods shall constitute a separate solvent cleaning operation.

(30) SOLVENT CONTAINER is that part of a cleaning device that holds the solvent.

(31) SOLVENT FLUSHING is the use of a solvent to remove uncured adhesives, uncured inks, uncured coatings, or contaminants from the internal surfaces and passages of the equipment by flushing solvent through the equipment.

(32) STRIPPING is the removal of cured coatings, cured inks, and cured adhesives.

(33) SURFACE PREPARATION is the removal of contaminants such as dust, soil, oil, grease, etc., prior to coating, adhesive, or ink applications.

(34) ULTRAVIOLET INKS are inks which dry by polymerization reaction induced by ultraviolet energy.

(35) VOC COMPOSITE PARTIAL PRESSURE is the sum of the partial pressures of the compounds defined as VOCs.

VOC Composite Partial Pressure is calculated as follows:

$$PP_c = \sum_{i=1}^{n} \frac{(W_i)(VP_i)/MW_i}{\frac{W_w}{MW_w} + \frac{W_e}{MW_e} + \sum_{i=1}^{n} \frac{W_i}{MW_i}}$$

Where:

W_i = Weight of the "i"th VOC compound, in grams

W_w = Weight of water, in grams

W_e = Weight of exempt compound, in grams

MW_i = Molecular weight of the "i"th VOC compound, in $\frac{g}{g\text{-mole}}$

MW_w = Molecular weight of water, in $\frac{g}{g\text{-mole}}$

MW_e = Molecular weight of exempt compound, in $\frac{g}{g\text{-mole}}$

PP_c = VOC composite partial pressure at 20°C, in mm Hg

VP_i = Vapor pressure of the "i"th VOC compound at 20°C, in mm Hg

(36) VOLATILE ORGANIC COMPOUND (VOC) is any chemical compound which contains the element carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, and exempt compounds.

(37) WIPE CLEANING is the method of cleaning a surface by physically rubbing it with a material such as a rag, paper, or a cotton swab moistened with a solvent.

(c) Requirements

(1) Solvent Requirements

A person shall not use a solvent to perform solvent cleaning operations, including the use of cleaning devices or methods, unless the solvent complies with the applicable requirements set forth below:

(A) Substrates Cleaning During Manufacturing Processes, and Surface Preparation for Coating, Adhesive, or Ink Applications.

The solvents used on substrates for cleaning during the manufacturing process or for surface preparation prior to coating, adhesive, or ink applications shall contain VOC equal to or less than the limits specified below:

(i) On and after July 1, 1992, the limit shall be 200 grams of VOC per liter of material.

(ii) On and after July 1, 1993, the limit shall be 70 grams of VOC per liter of material.

(B) Repair and Maintenance Cleaning

On and after July 1, 1992, the solvents used for repair or maintenance cleaning shall have a VOC content of 900 grams or less of VOC per liter of material and a VOC composite partial pressure of 20 mm Hg or less at 20°C (68° F).

(C) Cleaning of Coatings and Adhesives Application Equipment

On and after July 1, 1992, the solvents used for cleaning coatings or adhesives application equipment shall have a VOC content of 950 grams or less of VOC per liter of material and a VOC composite partial pressure of 35 mm Hg or less at 20°C (68° F).

(D) Cleaning of Polyester Resin Application Equipment

On and after July 1, 1992, the solvents used for cleaning polyester resin application equipment shall comply with one of the limits specified below:

(i) The solvent shall have a VOC content of 200 grams or less of VOC per liter of material; or

(ii) The solvent shall have a VOC content of 1100 grams or less of VOC per liter of material and a VOC composite partial pressure of 1.0 mm Hg or less at 20°C (68°F); or

(iii) A solvent reclamation system shall be used if the solvent contains more than 200 grams of VOC per liter of material or the solvent has a VOC composite partial pressure of more than 1.0 mm Hg at 20°C (68°F) and contains more than 1100 grams of VOC per liter of material, and the solvent usage exceeds four (4) gallons per day per facility. The reclamation system shall operate at least at 80 percent efficiency. The solvent residues for on-site reclamation system shall not contain more than 20 percent VOC, by weight.

(E) Cleaning of Ink Application Equipment

On and after July 1, 1992, the solvents used for cleaning of ink application equipment in graphic arts shall meet the limits specified below:

(i) The solvents used in screen printing shall have a VOC content of 1070 grams or less of VOC per liter of material and a VOC composite partial pressure of 5 mm Hg or less at 20°C (68°F).

(ii) The solvents used in lithographic and letterpress printing not subject to (c)(1)(E)(iv) shall have a VOC content of 900 grams or less of VOC per liter of material and a VOC composite partial pressure of 25 mm Hg or less at 20°C (68°F).

(iii) The solvents used in graphic arts printing operations not subject to (c)(1)(E)(i), (c)(1)(E)(ii), or (c)(1)(E)(iv) shall have a VOC content of 100 grams or less of VOC per liter of material and a VOC composite partial pressure of 3 mm Hg at 20°C (68°F).

(iv) The solvents used in graphic arts printing operations, except screen printing to remove ultraviolet inks from application equipment shall have a VOC content of 800 grams or less of VOC per liter of material and a VOC composite partial pressure of 33 mm Hg or less at 20°C (68°F).

(F) Cleaning of Electronic Assemblies

On and after July 1, 1992, the solvents used for manufacturing or maintenance cleaning of electronic assemblies shall have a VOC content of 900 grams or less of VOC per liter of material and a VOC composite partial pressure of 33 mm Hg or less at 20°C (68°F).

(2) Cleaning Devices and Methods Requirements

On and after July 1, 1992, a person shall not perform solvent cleaning operations unless one of the following cleaning devices or methods is used:

(A) Wipe cleaning;

(B) Spray bottles or containers with a maximum capacity of 16 fluid ounces from which solvents are applied without a propellant-induced force;

(C) Cleaning equipment which has a solvent container that can be, and is, closed during cleaning operations, except when depositing and removing objects to be cleaned, and is closed during nonoperation with the exception of maintenance and repair to the cleaning equipment itself;

(D) Cleaning device which is listed in the Office of Operations' manual "Alternative Devices for Rule 1171 Compliance" dated July 1, 1991. The Executive Officer shall periodically update the manual to identify any additional cleaning devices determined by the Executive Officer to result in equivalent or lower emissions;

(E) Remote reservoir cold cleaner used pursuant to the provisions of paragraph (c)(3);

(F) Non-atomized solvent flow method where the cleaning solvent is collected in a container or a collection system which is closed except for solvent collection openings and, if necessary, openings to avoid excessive pressure build-up inside the container; or

(G) Solvent flushing method where the cleaning solvent is discharged into a container which is closed except for solvent collection openings and, if necessary, openings to avoid excessive pressure build-up inside the container. The discharged solvent from the equipment must be collected into containers without atomizing into the open air. The solvent may be flushed through the system by air or hydraulic pressure, or by pumping.

(3) Remote Reservoir Cold Cleaners

Any person owning or operating a remote reservoir cold cleaner shall comply with all of the following requirements:

(A) Prevent solvent vapors from escaping from the solvent container by using such devices as a cover or a valve when the remote reservoir is not being used, cleaned, or repaired;

(B) Limit draft rate in the work room, as measured within three (3) feet from the location of the solvent discharge and parallel to the plane of the remote reservoir cold cleaner opening, to less than 9.1 meters per minute (30 feet per minute), unless necessary to meet Occupational Safety and Health Administration (OSHA) requirements;

(C) Direct solvent flow in a manner that will prevent liquid solvent from splashing outside of the remote reservoir cold cleaner;

(D) Do not degrease porous or absorbent materials, such as cloth, leather, wood, or rope; and

(E) Use only solvent containers free of all liquid leaks. Auxiliary equipment, such as pumps, pipelines, or flanges, shall not have any liquid leaks, visible tears, or cracks. Any liquid leak, visible tear, or crack detected shall be repaired within one (1) calendar day, or the leaking section of the remote reservoir cold cleaner shall be drained of all solvent and shut down until it is replaced or repaired.

(4) Storage and Disposal

Regardless of their VOC content, all VOC-containing materials used in solvent cleaning operations, such as solvents, and cloth and paper moistened with solvents, shall be stored in non-absorbent, non-leaking containers which shall be kept closed at all times except when filling or emptying.

(5) Control Equipment

In lieu of complying with the requirements in paragraphs (c)(1), (c)(2), or subparagraph (c)(6)(A), a person may comply by using collection and control systems in association with the solvent cleaning operation regulated by this rule provided:

(A) (i) The collection system collects at least 90 percent, by weight, of the emissions generated by the solvent cleaning operation; and the control system reduces VOC emissions from the emission collection system by at least 95 percent, by weight, or the output of the control system is less than 50 parts per million (PPM) calculated as carbon with no dilution; or

(ii) The collection and control systems meet the requirements of the applicable source specific rule of the District's Regulation XI; and

(B) A plan is submitted to the Executive Officer or his designee to demonstrate compliance with the requirements set forth above, and a prior written approval is received from the Executive Officer to operate the control equipment.

(6) General Prohibitions

(A) On and after July 1, 1992, a person shall not atomize any solvent into open air.

(B) On and after July 1, 1992, a person shall not specify or require any person to use solvent or equipment subject to the provisions of this rule that do not meet the requirements of this rule.

(C) On and after January 1, 1997, a person shall not perform solvent cleaning operations subject to the provisions of this rule with a solvent which contains Group II exempt compounds listed in subparagraph (b)(7)(B) except methylene chloride.

(7) Equivalency for Spray Gun Cleaning Devices

Until July 1, 1993, in lieu of complying with the requirements of paragraphs (c)(1) and (c)(2) applicable to spray gun cleaning operations, a person may comply by demonstrating to the satisfaction of the District Executive Officer that the total VOC emissions resulting from the use of its spray gun cleaning system (i.e., cleaning solvent and cleaning device) are not greater than the VOC emissions resulting from the use of spray gun cleaning systems designed and operated in full compliance with paragraphs (c)(1) and (c)(2). For the purposes of this paragraph, VOC emissions shall be determined in accordance with the District's "General Test Method for Determining Solvent Losses from Spray Gun Cleaning Systems."

(d) Exemptions

(1) The following solvent cleaning operations are not subject to any provision of this rule:

(A) Cleaning carried out in batch-loaded cold cleaners, open-top vapor degreasers, conveyorized degreasers, or film cleaning machines which are regulated under Rule 1122 - Solvent Degreasers.

(B) Cleaning operations subject to Rules 1102 - Petroleum Solvent Dry Cleaners, and 1102.1 - Perchloroethylene Dry Cleaning Systems.

(C) Cleaning operations subject to Rule 1164 - Semiconductor Manufacturing.

(D) Cleaning operations subject to Rule 1124 - Aerospace Assembly and Component Manufacturing Operations, except coating application equipment cleaning, and storage and disposal of VOC-containing materials used in solvent cleaning operations.

(E) Cleaning operations subject to Rule 1141.1 - Coatings and Ink Manufacturing.

(F) Janitorial cleaning.

(G) Stripping of cured coatings, cured adhesives, and cured inks.

(H) Cleaning of architectural coating application equipment until January 1, 1993.

(2) Wipe cleaning is not subject to the provisions of paragraph (c)(1) when carried out for any of the following applications:

(A) Cleaning of solar cells, laser hardware, and high-precision optics.

(B) Cleaning for: conducting performance laboratory tests on coatings, adhesives, or inks; research and development programs; and laboratory tests in quality assurance laboratories.

(C) Cleaning of polycarbonate plastics.

(D) Cleaning of motor vehicles on application lines subject to Rule 1115 - Motor Vehicle Assembly Line Coating Operations.

(3) Internal cleaning of the tips of automated spray equipment systems, except for robotic systems, and cleaning with spray bottles or containers described in subparagraph (c)(2)(B), are not subject to the provisions of subparagraph (c)(6)(A).

(4) Cleaning with aerosol products shall not be subject to the provisions of paragraph (c)(1) and subparagraph (c)(6)(A) if 160 fluid ounces or less per day per facility of aerosol products are used.

(5) Cleaning of cotton swabs to remove cottonseed oil before cleaning of high-precision optics shall not be subject to paragraph (c)(1).

(e) Compliance Test Methods

For the purpose of this rule, the following test methods shall be used. Other test methods determined to be equivalent after review by the staffs of the District, the Air Resources Board, and the United States Environmental Protection Agency, and approved in writing by the District Executive Officer may also be used.

(1) The VOC content of materials subject to the provisions of this rule shall be determined by:

(A) The Environmental Protection Agency (EPA) Reference Method 24 (Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coatings, Code of Federal Regulations Title 40, Part 60, Appendix A). The exempt compound's content shall be determined by the South Coast Air Quality Management District's (SCAQMD) Laboratory Methods of Analysis for Enforcement Samples - Section III, Methods 19 and 22; or

(B) SCAQMD's Laboratory Methods of Analysis for Enforcement Samples - Section III, Methods 16, 17, 19, 22, and 24.

(2) The efficiency of the emissions collection system shall be determined by the EPA method cited in 55 FR (Federal Register) 26865, June 29, 1990.

(3) The efficiency of the control device and the VOC content measured and calculated as carbon in the control device exhaust gases shall be determined by EPA's Test Methods 25, 25A, or SCAQMD's Method 25.1 (Determination of Total Gaseous Non-Methane Organic Emissions as Carbon). Emissions determined to exceed any limits established by this rule through the use of either of the above-referenced test methods shall constitute a violation of the rule.

(4) The identity of components in solvents shall be determined by SCAQMD's Laboratory Method of Analysis for Enforcement Samples - Section III, Method 27.

(5) The relative volume of components shall be determined by SCAQMD's Laboratory Method of Analysis for Enforcement Samples - Section III, Methods 19 and 22.

(6) Measurement of average workroom draft rate shall be measured parallel to the remote reservoir cold cleaner opening with a thermistor anemometer which has an accuracy of ±2 percent of reading plus 1/2 percent of full scale and is annually factory-calibrated in a National Institute of Standards and Technology traceable wind tunnel.

(f) Recordkeeping Requirements

Records shall be maintained pursuant to Rule 109 for all applications subject to this rule, including those exempted under section (d), except for the following:

(1) Facilities not subject to recordkeeping requirements of any other Regulation XI series rule.

(2) Cleaning operations performed with a solvent which has a water content of 98 percent or more, by weight, or a VOC composite partial pressure of 0.1 mm Hg or less at 20°C (68°F), or contains VOC consisting of more than 12 carbon atoms.

(g) Rule 442 Applicability

Any solvent, solvent cleaning operation, or a facility, which is exempt from all or a portion of this rule except paragraph (f)(1), shall be subject to the applicable requirements of the applicable Regulation XI source specific rule or Rule 442 - Usage of Solvent.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

STATIONARY SOURCE COMPLIANCE

MEMORANDUM

DATE: March 9, 1995

TO: SCAQMD Governing Board Members

FROM: Lee Lockie

SUBJECT: **AGENDA #8:**
Revisions to Rule 1171 - Solvent Cleaning Operations

A modification is needed in the Set Hearing Package for Rule 1171 - Solvent Cleaning Operations. This is today's agenda #8. The proposed modification is summarized below and presented in the attached errata sheet.

Rule 1171 currently requires storage of solvent laden cloth and rags in non-absorbent, non-leaking closed containers. This requirement has been burdensome for many businesses and we have recently convinced the California Air Resources Board of the wisdom of deleting this section of the rule. Furthermore, recent staff research has shown that these activities are already regulated under the Uniform Fire Code and federal Occupational Safety and Health Administration regulations. Deleting this requirement will have little or no effect on VOC emissions and is not expected to result in any adverse environmental or socioeconomic impacts.

LL:mm

cc: James Lents
Pat Leyden

AGENDA # 8

ERRATA

Proposed Amended Rule 1171 - Solvent Cleaning Operations

(c)(4) Storage and Disposal

~~Regardless of their VOC content, a~~All VOC-containing *~~materials~~ ~~such as~~* solvents *~~and cloth and paper moistened with solvents,~~* used in solvent cleaning operations ~~such as solvents, and cloth and paper moistened with solvents,~~ shall be stored in non-absorbent, non-leaking containers which shall be kept closed at all times except when filling or emptying. *It is recommended that cloth and paper moistened with VOC-containing solvents be stored in closed, non-absorbent, non-leaking containers.*

MODIFICATIONS TO PROPOSED AMENDED RULE 1171 STAFF REPORT

(PROPOSED AMENDMENTS)

7. Recommendation for Storage of Solvent Laden Cloth and Rags, Paragraph (c)(4)

Uniform Fire Code (International Conference of Building Officials) and federal Occupational Safety and Health Administration regulations (29 CFR Ch. XVII 1910.106(e)(9)) require the use of closed containers for the storage of solvent laden cloth and rags. ~~*In addition, the use of closed containers for solvent laden cloth and rags*~~ *results only in negligible air emission reductions. Because of the duplicative nature (see Health and Safety Code section 40727(f)) of the requirement, the language will be changed to a recommendation only.*

(PUBLIC COMMENTS)

6a. Storing solvent laden rags in non-absorbant, non-leaking, closed containers does not prevent the release of VOCs into the atmosphere. The requirement should be removed as only air tight containers (infeasible) would curtail emissions.

6b. The requirement for storage of solvent laden materials in closed containers should be retained. Several companies are able to reclaim the solvents and the practice improves housekeeping.

Response: While it is true that much of the VOC emissions are lost, the positive aspects *(i.e., fire safety and housekeeping)* outweigh the negative. In addition, *Uniform Fire Code and Occupational Safety and Health Administration regulations require* ~~good fire safety practices include~~ the use of closed containers for solvent laden rags and paper. Therefore, the requirement for non-leaking, closed containers will remain *but as a recommendation only.*

(CEQA REVIEW)

District staff has evaluated the proposed change to Rule 1171's storage and disposal requirement (Rule 1171 (c)(4)) and has determined that such a change will have little or no effect on VOC emissions from affected facilities and is not expected to result in significant adverse impacts in any other environmental areas. Further, the proposed change is expected to have little or no effect on existing storage and disposal practices since these activities are already regulated under the Uniform Fire Code and federal Occupational Safety and Health Administration regulations. The Final Supplemental Environmental Assessment will address the proposed amendment to the storage and disposal requirement in more detail.

AIR POLLUTION CONTROL DISTRICT
COUNTY OF SAN DIEGO

Air Pollution Control Officer
R. J. Sommerville

COLD SOLVENT CLEANER

Operating Requirements

1. The solvent cleaner, ventilation systems, and emission control equipment shall be installed and maintained in proper working order. The ventilation systems and emission control equipment shall be properly operating at all times when parts are being cleaned or solvent is being heated in the solvent cleaner.
2. There shall be no liquid solvent leaks from any portion of the degreasing equipment.
3. Solvent, including waste solvent and distillation residue, shall not be stored or disposed of in a manner that will cause or allow evaporation into the atmosphere.
4. Distillation residues shall not contain more than 10 percent solvent by volume after distillation recovery of waste.
5. Devices designed to cover the solvent shall not be removed except to process work or to perform maintenance.
6. Solvent agitation shall be achieved only by means of pump circulation, mechanical mixing, or with ultrasonics. Gas agitation shall not be used.
7. For solvent cleaners employing sprays, except gas-path cleaners, the stream pressure shall be low enough to prevent liquid splashing outside the container.
8. No porous or absorbent materials, such as cloth leather, wood, or rope shall be cleaned with solvent. This provision does not apply to stripping of wood products using solvent which are more than 50% by volume of any combination of 1,1,1,-trichloroethane and methylene chloride.
9. Solvent cleaner operators shall maintain records of the types, amounts, and dates of solvents added to and removed from each solvent cleaners. The records shall be maintained for three (3) years and made available to the Air Pollution Control Officer immediately upon request.
10. Cleaned parts shall be drained until dripping ceases.
11. The solvent cleaner liquid level shall not be above the marked maximum solvent level line.
12. For remote-reservoir cleaners, the cover of the solvent reservoir shall be closed at all times except when the reservoir is being cleaned or repaired.
13. For remote-reservoir cleaners, the portion of the solvent cleaner where parts are cleaned shall not be exposed to drafts greater than 40 meters per minute (131 feet per minute).

12/01/92

RULE 67.6. SOLVENT CLEANING OPERATIONS (Effective 7/25/79: Rev. Effective 10/16/90)

(a) APPLICABILITY

This rule is applicable to all surface cleaning or stripping operations or gas-path cleaners which use solvents for the purpose of removing surface impurities or coatings, and preparing parts or products for painting, plating, repair, inspection, assembly, heat treatment, or for any other use. This rule is also applicable to operations which immerse items in solvent-rich atmospheres for heating or any other purpose, including vapor-phase solder reflow operations.

(b) EXEMPTIONS

(1) Cleaning Material

The provisions of Section (d) shall not apply to any solvent cleaner installed, or for which application for an Authority to Construct was received, before September 1, 1980, and which, prior to and since September 1, 1980, has continuously employed exclusively any of the following cleaning materials:

(i) 1,1,1-Trichloroethane

(ii) Trichlorotrifluoroethane

(iii) Methylene Chloride

The provisions of Section (d) shall not apply to any cold solvent cleaner with a liquid surface area less than 5 square feet and vapor solvent cleaner with a vapor-air interface less than 5 square feet installed, or for which application for an Authority to Construct was received before October 16, 1990, and that employ any of the following cleaning materials:

(i) 1,1,1-Trichloroethane

(ii) Trichlorotrifluoroethane

(iii) Methylene Chloride

(2) Wipe Cleaning

The provisions of Section (d) shall not apply to any solvent cleaning operation employing only wipe cleaning.

(3) The provisions of Section (d) shall not apply to any cold solvent cleaner dip tank with a liquid surface area of 1 square foot (0.09 square-meters) or less, or with a capacity of 1 gallon or less.

(4) Operations Subject to Rules 67.9 or 67.11.

The provisions of Section (d) shall not apply to non-immersion stripping or coating equipment cleanup operations subject to the requirements of Rule 67.9 or Rule 67.11.

(5) Dry Cleaning Operations.

The provisions of Section (d) shall not apply to the application of solvent to garments, fabrics, or leather for the purposes of cleaning when such applications are subject to the requirements of Rule 67.2 or Rule 67.8.

(c) DEFINITIONS

(1) **"Cold Solvent Cleaner"** means any non-boiling solvent cleaner, excluding conveyorized solvent cleaners, vapor solvent cleaners, and gas-path cleaners, and wipe cleaning operations, and including spray sinks, spray booths, strippers, remote-reservoir cleaners, and dip tanks. Solvent cleaners which employ heated but non-boiling solvents shall be considered cold solvent cleaners.

(2) **"Conveyorized Cold Solvent Cleaner"** means any continuously loaded, solvent cleaner which is not a conveyorized vapor solvent cleaner.

(3) **"Conveyorized Vapor Solvent Cleaner"** means any continuously loaded solvent cleaner which immerses parts in boiling solvent or in solvent vapors generated by boiling solvent. Conveyorized solvent cleaners which contain any vapor solvent cleaning sections shall be considered conveyorized vapor solvent cleaners.

(4) **"Existing Unit"** means, for the purposes of this rule, one which was installed and operating in San Diego County before October 16, 1990.

(5) **"Freeboard Chiller"** means a condenser placed above the primary condenser which provides a blanket of cold air above the vapor-air interface to reduce emissions.

(6) **"Freeboard Height"** means

(i) For cold solvent cleaner dip tanks, the distance from the maximum solvent level line to the top of the tank.

(ii) For open-top vapor solvent cleaners, the distance from the solvent vapor-air interface to the top of the solvent cleaner tank.

(iii) For conveyorized solvent cleaners, the distance from the top of the solvent or solvent vapor-air interface to the bottom of the lowest entrance of the solvent cleaner.

(7) **"Freeboard Ratio"** means the freeboard height divided by the smaller of the interior length or width of the solvent cleaner tank.

(8) **"Gas-Path Cleaner (Corrosion Control Cart)"** means equipment which applies solvent to the interiors of gas turbines or jet engines for removal of corrosion or combustion deposits.

(9) **"Liquid Leak"** means any visible leak of liquid solvent at a rate in excess of three drops per minute.

(10) **"Liquid Surface Area"** means the area of the interface between the liquid solvent available for dipping and the air which is contiguous with the outside of the solvent cleaner. The area of surfaces wetted by the solvent before it drains into a reservoir in a section of the solvent cleaner used for parts drainage and not used for dipping shall not be included in the liquid surface area.

(11) **"Open-top Vapor Solvent Cleaner"** means any batch loaded, vapor solvent cleaner.

(12) **"Organic Compound"** means any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, and methane) which might be emitted during use, processing, application, curing, or drying of a solvent or other material.

(13) **"Remote-Reservoir Solvent Cleaner"** means any batch-loaded cold solvent cleaner in which liquid solvent is pumped to a sink-like work area which drains back into a liquid solvent tank, which is completely enclosed except for the drain opening, while parts are being cleaned. For the purposes of this rule any cold solvent cleaner except for wipe stations, dip tanks, and gas-path cleaners shall be considered a remote-reservoir solvent cleaner.

(14) **"Solvent"** means, for the purposes of this rule, any liquid containing more than 10 percent by weight of organic compounds and which is used to dissolve, clean, strip, or remove impurities, coatings, stains, or films from surfaces.

(15) **"Solvent Cleaner"** means a device which applies solvent or in which solvent is applied to items for the purpose of removing or stripping impurities, coatings, stains, or films.

(16) **"Stripper"** means a solvent cleaner in which solvent is applied to a surface for the purpose of removing a film, coating, or stain, including, but not limited to, dip tanks and spray sinks.

(17) **"Stripping"** means applying solvent to remove a coating or film from a surface.

(18) **"Vapor-Air Interface"** means the area of contact between the solvent vapors and air which is contiguous with the air outside the solvent cleaner.

(i) The area of the vapor-air interface shall be calculated as the product of the lengths between internal solvent cleaner walls behind the condensing coils.

(ii) The perimeter of the vapor-air interface shall be calculated as the sum of the lengths of the internal solvent cleaner walls behind the condensing coils.

(19) **"Vapor-Phase Solder Reflow Unit"** means a device in which parts are immersed in an organic compound-rich vapor generated by boiling a liquid for heating to melt or soften solder connections of electronic components. For the purposes of this rule batch-loaded vapor-phase solder reflow units shall be considered open-top vapor solvent cleaners and continuously loaded vapor-phase solder reflow units shall be considered conveyorized vapor solvent cleaners.

(20) **"Vapor Solvent Cleaner"** means a solvent application device in which parts are immersed in an organic compound-rich vapor generated by boiling a liquid for cleaning. For the purposes of this rule vapor-phase solder reflow units shall be considered to be vapor solvent cleaners. For the purposes of this rule solvent cleaners which immerse parts in boiling solvent shall be considered vapor solvent cleaners.

(21) **"Wipe Cleaning"** means that method of cleaning which utilizes a material, such as a rag, wetted with a solvent, coupled with a physical rubbing process to remove contaminants from surfaces.

(d) STANDARDS AND REQUIREMENTS

(1) General Equipment Requirements. A person shall not operate a solvent cleaner unless all of the following are used:

(i) A container for the solvent ;

(ii) An apparatus or cover which completely covers the solvent container when not processing work;

(iii) A facility for draining cleaned parts such that drained solvent is returned to the container; and

(iv) A permanent, conspicuous, legible label listing the applicable operating requirements contained in Subsections (d)(5) through (d)(9).

(2) Cold Solvent Cleaner Equipment Requirements. A person shall not operate a cold solvent cleaner unless the requirements of Subsection (d)(1) are met and the following are used:

(i) A cover which is easily operable with one hand or mechanically assisted.

(ii) For dip tanks or dip sections, a readily visible, permanent mark or line indicating the maximum allowable solvent level.

(iii) For dip tanks, a freeboard ratio greater than or equal to 0.5.

(iv) For remote-reservoir cleaners, a solvent with a vapor pressure of organic compounds less than 33 mm Hg at 38°C (0.6 psia at 100°F): This provision does not apply to stripping of wood products with any combination of 1,1,1-trichloroethane or methylene chloride.

(v) For cold solvent cleaners employing sprays, spray nozzles which produce continuous liquid flows, not fine atomized nor shower-type sprays.

(vi) For cold solvent cleaners employing solvent with a vapor pressure of organic compounds greater than 33 mm Hg (0.6 psia) at 38°C (100°F) or employing solvent heated above 50°C (122°F).

(A) an internal drainage device, such that parts are enclosed under the cover of the solvent cleaner while draining; and

(B) a freeboard ratio greater than or equal to 0.75; or

(C) a water cover, provided the solvent is insoluble in and denser than water.

(3) Open-top Vapor Solvent Cleaner and Conveyorized Solvent Cleaner Equipment Requirements: A person shall not operate an open-top vapor solvent cleaner or conveyorized solvent cleaner unless the requirements of Subsection (d)(1) are met and the following are used:

(i) A cover which can be easily operated without disturbing the vapor layer;

(ii) A primary condensing coil situated above the boiling solvent, except for conveyorized cold solvent cleaners;

(iii) All of the following safety devices, except for conveyorized cold solvent cleaners:

(A) a device which shuts off the sump heat if the condenser coolant stops circulating, except for refrigerated condensers;

(B) a device which shuts off the sump heat if the condenser coolant or refrigerant becomes warmer than the designed operating temperature;

(C) a device which shuts off the sump heat if the vapor level rises above the designed operating level and which is only manually resettable; and

(D) for solvent cleaners of the spray type, a device which prevents spray pump operation if the solvent vapor-air interface falls below the designed operating level.

(iv) For solvent cleaners employing sprays:

(A) spray nozzles which produce continuous liquid flows, not fine atomized or shower type sprays; or

(B) sprays which are located below the vapor-air interface.

(v) For open-top vapor solvent cleaners with a vapor-air interface area greater than 1 square meter (10.76 square feet), conveyorized vapor solvent cleaners with an vapor-air interface area greater than 2 square meters (21.52 square feet), and conveyorized cold solvent cleaners with a liquid surface area greater than 2 square meters (21.52 square feet).

(A) an automated cover-elevator system which opens only when the dry part is actually entering or exiting the solvent cleaner, except for conveyorized solvent cleaners; or

(B) a freeboard ratio greater than or equal to 0.75 and a powered cover, except for conveyorized solvent cleaners; or

(C) a refrigerated freeboard chiller having a minimum of 500 BTU per hour cooling capacity per foot along the vapor-air interface perimeter or a refrigerated condenser coil having a minimum cooling capacity of 100 percent of the boiling sump heat input rate; or

(D) a carbon adsorption system with ventilation greater than or equal to 15 cubic meters per minute per square meter (50 cubic feet per minute per square foot) of vapor-air interface area and a control efficiency of 90 percent or more by weight of organic compounds ; or

(E) a control system which has a control efficiency at least as effective as any of the above and which is approved by the Air Pollution Control Officer on an annual basis and meets the requirements of Section (e).

(vi) For all conveyorized solvent cleaners, the following:

(A) a drying tunnel, which is an extension from the exit of the conveyorized solvent cleaner to allow more time for the cleaned parts to drain completely, or other means sufficient to prevent cleaned parts from carrying solvent liquid out of the solvent cleaner, and

(B) minimized openings such that entrances and exits shall silhouette work loads with an average clearance between parts and the edge of the solvent cleaner opening less than 10 centimeters or less than 10 percent of the opening width.

(4) Gas-Path Cleaner (Corrosion Control Cart) Requirements: A person shall not operate a gas-path cleaner unless the requirements of Subsection (d)(1) are met and a solvent with a vapor pressure of organic compounds less than 33 mm Hg at 38°C (0.6 psia at 100°F) and greater than 75 percent water by volume or a vapor pressure of organic compounds less than 1 mm HG at 38°C (0.6 psia at 100°F) and greater than 50 percent water by volume is used.

(5) General Operating Requirements: Any person who operates a solvent cleaner shall conform to the following operating requirements.

(i) The solvent cleaner, ventilation systems, and emission control equipment shall be installed and maintained in proper working order. The ventilation systems and emission control equipment shall be properly operating at all times when parts are being cleaned or solvent is being heated in the solvent cleaner.

(ii) There shall be no liquid solvent leaks from any portion of the degreasing equipment.

(iii) Solvent, including waste solvent and distillation residue, shall not be stored or disposed of in a manner that will cause or allow evaporation into the atmosphere.

(iv) Distillation residues shall not contain more than 10 percent solvent by volume after distillation recovery of waste.

(v) Devices designed to cover the solvent shall not be removed except to process work or to perform maintenance.

(vi) Solvent agitation shall be achieved only by means of pump circulation, mechanical mixing, or with ultrasonics. Gas agitation shall not be used.

(vii) For solvent cleaners employing sprays, except gas-path cleaners, the stream pressure shall be low enough to prevent liquid splashing outside the container.

(viii) No porous or absorbent materials, such as cloth, leather, wood, or rope shall be cleaned with solvent. This provision does not apply to stripping of wood products using solvents which are more than 50% by volume of any combination of 1,1,1-trichloroethane and methylene chloride.

(ix) Solvent cleaner operators shall maintain records of the types, amounts, and dates of solvents added to and removed from each solvent cleaner. The records shall be maintained for three years and made available to the Air Pollution Control Officer immediately upon request.

(6) Cold Solvent Cleaner Operating Requirements: Any person who operates a cold solvent cleaner shall conform to requirements of Subsection (d)(5) and the following:

(i) Cleaned parts shall be drained until dripping ceases.

(ii) The solvent cleaner liquid level shall not be above the marked maximum solvent level line.

(iii) For remote-reservoir cleaners, the cover of the solvent reservoir shall be closed at all times except when the reservoir is being cleaned or repaired, and

(iv) For remote-reservoir cleaners, the portion of the solvent cleaner where parts are cleaned shall not be exposed to drafts greater than 40 meters per minute (131 feet per minute).

(7) Open-top Vapor Solvent Cleaner Operating Requirements: Any person who operates an open-top vapor solvent cleaner shall conform to the requirements of Subsection (d)(5) and the following:

(i) Solvent carry-out shall be minimized by all of the following methods:

(A) racking parts for full drainage;

(B) moving parts in and out of the solvent cleaner at a speed less than 3.3 meters per minute;

(C) cleaning the workload in the vapor zone until condensation ceases;

(D) tipping out any pools of solvent on the cleaned parts before removal; and

(E) not removing parts from the solvent cleaner until visually dry.

(ii) Solvent shall not be sprayed above the vapor-air interface.

(iii) Solvent cleaner exhaust ventilation systems, if used, shall not exceed 20 cubic meters per minute per square meter (65 cubic feet per minute per square foot) of solvent cleaner vapor-air interface area, unless necessary to meet OSHA requirements. Comfort ventilation fans shall not be positioned near the solvent cleaner opening in such a way as to disturb the vapor zone. Lip ventilation, located below the cover of the solvent cleaner, if used, shall be turned off when the solvent cleaner is covered.

(iv) Water shall not be visibly detectable in the organic compound phase exiting the water separator, nor shall organic compounds be visibly detectable in the aqueous phase leaving the separator.

(v) Workloads placed in the solvent cleaner shall have an occupied, horizontal cross-sectional area less than one half of the vapor-air interface area.

(vi) During start up, the primary condenser and refrigerated freeboard chiller, if used, shall be turned on either simultaneously or before the sump heater. During shutdown, the sump heater shall be turned off, either simultaneously or before the condenser coolant and refrigerated freeboard chiller are turned off. The solvent cleaner shall be covered whenever the primary condenser is turned off.

(8) Conveyorized Solvent Cleaner Operating Requirements: Any person who operates a conveyorized solvent cleaner shall conform to the requirements of Subsection (d)(5) above and the following:

(i) Solvent carry-out shall be minimized by the following methods:

(A) racking parts for best drainage;

(B) for conveyorized vapor solvent cleaners, maintaining vertical conveyor speed at less than 3.3 meters (11 feet) per minute; and

(C) for conveyorized cold solvent cleaners, draining parts until dripping ceases.

(ii) Solvent cleaner exhaust ventilation systems shall not exceed 20 cubic meters per minute per square meter (65 cubic feet per minute per square foot) of solvent cleaner open area, unless necessary to meet OSHA requirements. Comfort ventilation fans shall not be positioned near the solvent cleaner opening in such a way as to disturb the vapor zone.

(iii) Water shall not be visibly detectable in the organic compound phase exiting the water separator, nor shall organic compounds be visibly detectable in the aqueous phase leaving the separator.

(iv) During startup, the primary condenser and refrigerated freeboard chiller, if used, shall be turned on either simultaneously or before the sump heater. During shutdown, the sump heater shall be turned off, either simultaneously or before the condenser coolant and refrigerated freeboard chiller are turned off. The solvent cleaner shall be covered whenever the primary condenser is turned off.

(9) Gas-Path Cleaner (Corrosion Control Cart) Operating Requirements: Any person who operates a gas-path cleaner shall conform to the requirements of Subsection (d)(5) and the following:

(i) Cleaned parts shall be drained until dripping ceases.

(ii) The cover of the solvent reservoir shall be closed at all times except when the reservoir is being cleaned or repaired.

(iii) Solvent cleaning operations shall not be conducted in areas with air flows greater than 135 meters per minute (5 miles per hour).

(e) ALTERNATIVE CONTROL

(1) The provisions of Section (d) shall not apply if alternative methods which reduce emissions of organic compounds from the solvent cleaning operations by at least 85 percent by weight are employed, such as:

(i) Venting the organic compound emissions from a solvent cleaning operation through an air pollution control device approved by the Air Pollution Control Officer,

(ii) Reducing the emissions of organic compounds from a solvent cleaning operation through the use of low volatility cleaning materials.

When employing low volatility cleaning materials, the reduction shall be determined by comparing the organic compound emissions which occur when employing the low volatility cleaning materials with the organic compound emissions that occur when employing the organic solvent cleaning material that was in use on or before September 1, 1980. Such demonstration shall be done using methods and procedures approved by the Air Pollution Control Officer.

(2) Any person electing to comply by one or more alternative control measures shall first submit a plan to the Air Pollution Control Officer, for approval, showing how compliance will be achieved. Such plan shall include documentation sufficient to identify and characterize the cleaning materials in use on or before September 1, 1980 and shall include a protocol describing how compliance shall be demonstrated. The protocol shall include methods and procedures approved by the Air Pollution Control Officer.

(3) Any person electing to comply by one or more alternative control measures shall first submit an application for authorization to contruct and permit to operate or for modified permit to operate to the Air Pollution Control Officer. Such person shall reimburse the District for all District costs incurred in evaluating an alternative compliance demonstration. The District costs shall be determined using the labor rates specified in Rule 40, Schedule 94.

(4) An alternative control measure subject to the provisions of this section shall be submitted as a Source-Specific Revision to the State Implementation Plan (SIP) for Solvent Metal Cleaning by the USEPA. The Air Pollution Control Officer shall not accept a method as equivalent under this Section unless it has been accepted as a Source-Specific SIP Revision.

(f) TEST METHODS

Measurement of organic compounds subject to Section (d) of this rule shall be conducted and reported in accordance with EPA Test Method 24 (40 CFR 60, Appendix A) as it exists on October 16, 1990.

Measurements of the water and exempt solvent vapor content pursuant to Subsections (d)(2) and (d)(4), and Section (e) of this rule shall be conducted in accordance with ASTM Test Methods D4457-85 and D3792-86.

Measurement of organic compound subject to Subsections (d)(3) or (e) of this rule shall be conducted and reported in accordance with the EPA Guidelines for Capture Efficiency and EPA Test Method 25 (40 CFR 60, Appendix A) as it exists on October 16, 1990.

Total absolute vapor pressure of VOC containing compounds pursuant to Subsections (d)(2) and (d)(4) of this rule shall be calculated using the District's "Procedure for Estimating the Vapor Pressure of a Solvent Mixture" as it exists on October 16, 1990. If the vapor pressure of the liquid mixture exceeds the limits specified in Subsections (d)(2) and (d)(4) as applicable, the vapor pressure shall be determined in accordance to ASTM Test Method D 2879-83, Vapor Pressure-Temperature Relationship and Initial Decomposition Temperature of Liquids by Isoteniscope.

(g) COMPLIANCE SCHEDULE

(1) The following new requirements for cold solvent cleaners shall not take effect for existing units until October 16, 1991: Subsections (d)(2)(i) thru (d)(2)(iv) and (d)(2)(vi)(A).

(2) The following equipment requirements for open-top vapor solvent cleaners shall not take effect for existing units until October 16, 1991: Subsections (d)(3)(i).

(3) The following equipment requirements for vapor-phase solder reflow units shall not take effect until October 16, 1991: Subsections (d)(3)(i) thru (d)(3)(vi).

(4) The following equipment requirements for vapor-phase solder reflow units shall not take effect until October 16, 1991: Subsections (d)(3)(iii) and (d)(9)(iii).

Air Pollution Control District
9150 Chesapeake Drive
San Diego CA 92123
Ph: (619) 694-3307

RULE 67.16. GRAPHIC ARTS OPERATIONS (Effective 10/18/88: Rev. Effective 9/20/94)

(a) APPLICABILITY

(1) This rule is applicable to all continuous web or single sheet fed graphic arts printing, processing, laminating or drying operations.

(2) Operations subject to this rule shall not be subject to Rule 66.

(b) EXEMPTIONS

(1) The provisions of Sections (d) and (e) of this rule shall not apply to stationary sources which emit less than an average of 15 lbs (6.8 kg) of volatile organic compounds (VOCs) from all graphic arts operations per day of operation for each calendar month. It is the responsibility of any person claiming an exemption pursuant to Subsection (b)(1) to maintain daily or monthly records as specified in Section (f) of this rule necessary to establish average daily emissions and to make this information available to the District upon request. The average daily emission levels shall be determined by recording and taking into account the number of operational days per given month.

(2) The provisions of Sections (d), (e), and (f) of this rule shall not apply to:

(i) All proofing systems.

(ii) Manufacture of:

(A) Solar control window film,

(B) Heat applied transfer decals,

(C) Ceramic decals manufactured for firing above 800°F, or

(D) Water slide decals.

(iii) Printing on ceramic or circuit boards.

(iv) Embossing and foil stamping which do not use materials containing VOC.

(v) Coating operations subject to Rule 67.5, Paper, Film and Fabric Coating Operations.

(vi) Development process associated with the preparation of lithographic printing plates.

(vii) Blanket repair material applied from non-refillable aerosol containers of four ounces or less.

(c) DEFINITIONS

For the purpose of this rule the following definitions shall apply:

(1) **"Coating"** in the graphic arts means a layer of material applied to a substrate in a relatively unbroken film.

(2) **"Exempt Compound"** means any of the following compounds or classes of compounds: 1,1,1-trichloroethane, methylene chloride, trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), trifluoromethane (HFC-23), trichlorotrifluoroethane (CFC-113), dichlorotetrafluoroethane (CFC-114), chloropentafluoroethane (CFC-115), chlorodifluoromethane (HCFC-22), dichlorotrifluoroethane (HCFC-123), dichlorofluoroethane (HCFC-141b), 1,1,1,2-tetrafluoroethane (HFC-134a), 1,1,2,2-tetrafluoroethane (HFC-134), chlorodifluoroethane (HCFC-142b), 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124), pentafluoroethane (HFC-125), 1,1,1-trifluoroethane (HFC-143a), 1,1-difluoroethane (HFC-152a), and the following four classes of perfluorocarbon (PFC) compounds:

(i) cyclic, branched, or linear, completely fluorinated alkanes;

(ii) cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;

(iii) cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and

(iv) sulfur-containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

(3) **"Exterior Marking"** means any outdoor sign printed, coated or laminated by any of the graphic arts methods.

(4) **"Flexographic Printing"** means a letterpress method utilizing flexible rubber or other elastomeric plate.

(5) **"Fountain Solution"** means the solution which is applied to the image plate to maintain the hydrophilic properties of the non-image areas.

(6) **"Graphic Arts"** means all screen, gravure, letterpress, flexographic and lithographic printing processes, or related coating, or laminating processes including laboratory or experimental processes and coating of flexible packaging materials for food or health care products.

(7) **"Graphic Arts Line"** means printing application equipment, coating equipment, laminating equipment, flash-off areas, ovens, conveyors or other equipment operating in an uninterrupted series to produce graphic arts using graphic art materials.

(8) **"Graphic Arts Material"** means any inks, coatings, adhesives, fountain solutions, thinners, or retarders used in printing or related coating or laminating processes.

(9) **"Gravure Printing"** means an intaglio process in which the ink is carried in minute etched or engraved wells on a roll or cylinder, with excess ink being removed from the surface by doctor blade.

(10) **"Lamination"** means a process of composing two or more layers of material to form a single multiple layer sheet by using adhesive.

(11) **"Letterpress Printing"** means a method where the image area is raised relative to the non-image area and the ink is transferred to the paper directly from the image surface.

(12) **"Lithographic Printing"** means a plane-o-graphic method in which the image and non-image areas are on the same plane, and the ink is offset from a plate to a rubber blanket, and then from the blanket to the substrate.

(13) **"Printing"** means any operation that imparts color, design, alphabet or numerals on a substrate.

(14) **"Printing Ink"** means any fluid or viscous composition used in printing, impressing or transferring an image onto a substrate.

(15) **"Proofing System"** means a system used only to check the quality or print color reproduction and editorial content and includes proof presses and/or off-press proofing lines.

(16) **"Publication Gravure"** means a gravure printing on paper substrate which is subsequently used to form books, magazines, catalogues, brochures, directories, and newspaper supplements or other printed material.

(17) **"Screen Printing"** means a process where the printing ink passes through a web or a fabric to which a refined form of stencil has been applied. The stencil openings determine the form and dimensions of imprint.

(18) **"Stationary Source"** means the same as is defined in Rule 20.1.

(19) **"Volatile Organic Compound (VOC)"** for the purpose of this rule means any volatile compound containing at least one atom of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, ammonium carbonate, metallic carbides and carbonates, and exempt compounds which may be emitted to the atmosphere during the application of and/or subsequent drying or curing of graphic arts materials or cleaning materials subject to this rule. VOC content of graphic arts material, except for thinners and cleaning materials, is expressed in grams of VOC per liter of material as applied, minus water and minus exempt compounds. VOC content of thinners and cleaning materials is expressed in grams of VOC per liter of material.

(20) **"Web-fed"** means an automatic system which supplies substrate from a continuous roll or from an extrusion process.

(d) STANDARDS

(1) Graphic Arts Material

A person shall not operate any printing or graphic arts process unless:

(i) Only graphic arts materials containing less than 300 grams of VOC per liter (2.5 lbs/gal) as applied, less water and exempt compounds are used; and

(ii) Only fountain solutions containing no more than 15% by volume VOC, as applied, are used.

(2) Cleanup of Equipment

A person shall not use materials containing VOC's for the cleanup of equipment used in graphic arts operations unless:

(i) The cleaning solvent has a VOC content of less than 200 grams per liter of material; or

(ii) The total VOC vapor pressure of the material is 45 mm of Hg at 20°C or less; or

(iii) A system is used that totally encloses the component parts being cleaned during the washing, rinsing, and draining processes; or

(iv) The cleaning solvent is transferred through the application equipment, without exposure to air, into a container which has in place an apparatus or cover which completely covers the container and has no visible holes, breaks, openings or separations between adjoining components of the container or container cover. Containers may be equipped with vents provided such vents are necessary to comply with applicable fire and safety codes.

(e) CONTROL EQUIPMENT

(1) In lieu of complying with the provisions of Subsection (d)(1), a person may use an air pollution control system which:

(i) Has been installed in accordance with an Authority to Construct; and

(ii) Includes an emission collection system which captures and transports organic gaseous emissions to an air pollution control device; and

(iii) Has a combined VOC emissions capture and control device efficiency of at least 85 percent by weight.

(2) A person subject to the requirements of this section shall submit to the Air Pollution Control Officer for approval an Operation and Maintenance (O&M) plan for the proposed emission control device and emission collection system. Such plan shall:

(i) Identify all key system operating parameters. Key system operating parameters are those necessary to ensure compliance with Subsection (e)(1)(iii), such as temperature, pressure, and/or flow rate.

(ii) Include proposed inspection schedules, anticipated ongoing maintenance, and proposed recordkeeping practices regarding the key system operating parameters.

(3) The Operation and Maintenance plan must be submitted to the Air Pollution Control Officer and receive approval prior to operation of the air pollution control equipment. A person subject to the requirements of this section shall implement the plan on approval of the Air Pollution Control Officer.

(f) RECORDKEEPING

Any person applying graphic arts materials shall maintain records in accordance with the following requirements:

(1) Maintain a current list of graphic arts materials containing VOC's such as inks, adhesives, thinners, retarders, fountain solutions and cleaning materials in use which provides data necessary to evaluate compliance, including, but not limited to:

(i) Type of graphic arts material or cleaning material used;

(ii) Dilution ratio of mixed components;

(iii) VOC content and/or vapor pressure of each graphic arts material and cleaning material, as applied.

(2) Maintain daily or monthly records showing the amount of each graphic arts material used including, but not limited to, inks, adhesives, thinners, retarders, fountain solutions and cleaning solutions.

(3) Any person using control equipment pursuant to Section (e) of this rule shall:

(i) For all graphic arts materials not in compliance with Subsection (d)(1) of this rule, maintain daily records of the amount of each material used; and

(ii) Maintain daily records sufficient to document continuous compliance with Subsection (e)(1)(iii), including records of key system operating parameters as approved in the Operation and Maintenance plan.

These records shall be retained on site for at least three years and shall be made available to the District upon request.

(g) TEST METHODS

(1) Measurements of VOC content subject to Section (d) of this rule shall be conducted and reported in accordance with EPA Test Method 24 (40 CFR 60, Appendix A) as it exists on September 20, 1994, and ASTM Test Method D 4457-85 for determination of dichloromethane and 1,1,1-trichloroethane in paints and coatings by direct injection into a gas chromatograph.

(2) Measurements of VOC content of rotogravure publication inks subject to Section (d) of this rule shall be conducted and reported in accordance with EPA Test Method 24A (40 CFR 60, Appendix A) as it exists on September 20, 1994, and ASTM Test Method D 4457-85 for determination of dichloromethane and 1,1,1,-trichloroethane in paints and coatings by direct injection into a gas chromatograph.

(3) Measurements of VOC emissions subject to Section (e) of this rule shall be conducted in accordance with EPA Methods 18, and 25 or 25A (40 CFR 60, Appendix A) as they exist on September 20, 1994. Test procedures shall be performed in accordance with a protocol approved by the Air Pollution Control Officer.

(4) Measurements of vapor pressures of VOC containing compounds pursuant to Subsection (d)(2)(ii) of this rule shall be calculated using the District's "Procedure for Estimating the Vapor Pressure of a Solvent Mixture," as it exists on September 20, 1994. If the vapor pressure of the liquid mixture is in excess of the limit specified in Subsection (d)(2)(ii), the vapor pressure shall be determined in accordance with ASTM Test Method D 2879-83, "Vapor Pressure-Temperature Relationship and Initial Decomposition Temperature of Liquids by Isoteniscope."

(5) Measurements of VOC content pursuant to Subsection (d)(1)(ii) shall be conducted and reported in accordance with ASTM Standard Recommended Practices for General Gas Chromatography Procedures, E 260-85.

(6) Perfluorocarbon (PFC) compounds and other exempt compounds shall be assumed to be absent from a coating, cleaning, or surface preparation material subject to this rule unless a manufacturer of the material or a facility operator identifies the specific individual compound(s) and the amount(s) present in the material and provides an EPA and ARB approved test method which can be used to quantify the specific compounds.

APCD 32 REV. 11/85

81078
CONTROL NO.

COUNTY OF SAN DIEGO
R POLLUTION CONTROL DISTRICT
9150 CHESAPEAKE DRIVE SAN DIEGO, CA 92123-1095
(619) 694-3307

AUTHORITY TO CONSTRUCT AND
PERMIT TO OPERATE

PERMIT NO.
650100
EXPIRES
JANUARY 1, 1995

THE FOLLOWING IS HEREBY GRANTED A PERMIT TO OPERATE THE ARTICLE, MACHINE, EQUIPMENT OR CONTRIVANCE DESCRIBED BELOW. THIS PERMIT IS NOT TRANSFERABLE TO A NEW OWNER, NOR IS IT VALID FOR OPERATION OF THE EQUIPMENT AT ANOTHER LOCATION, EXCEPT FOR PORTABLE EQUIPMENT.

[NAME AND ADDRESS REMOVED]

EQUIPMENT DESCRIPTION **FEE PAID**

ONE (1) BUILD-ALL CORPORATION MODEL WH 16-30 REMOTE RESERVOIR CLEANER, 32.0 L X 22.0 W X 8.0 H INCHES INTERNAL DIMENSIONS, EQUIPPED WITH A LID AND CONTINUOUS LIQUID FLOW THRU BRUSH USING APPROVED CLEANING SOLVENTS SUPPLIED BY INDUSTRIAL SOLVENT AND CHEMICAL.

920822

A 93112A 650100 0344L 28K01

THIS PERMIT HAS BEEN ISSUED SUBJECT TO THE FOLLOWING CONDITIONS. FAILURE TO COMPLY WITH THESE CONDITIONS IS A MISDEMEANOR.

1. THE REMOTE RESERVOIR SHALL NOT BE OPERATED IN SUCH A MANNER AS TO ALLOW SOLVENT TO ACCUMULATE IN THE SINK WORK AREA.
2. NO POROUS OR ABSORBENT MATERIALS, SUCH AS CLOTH, LEATHER, WOOD, OR ROPE SHALL BE CLEANED WITH SOLVENT.
3. CURRENT MATERIAL SAFETY DATA SHEETS (MSDS) OR MANUFACTURER'S SPECIFICATIONS REGARDING VOLATILE ORGANIC COMPOUND (VOC) CONTENT SHALL BE MAINTAINED ONSITE AND MADE READILY AVAILABLE TO THE DISTRICT UPON REQUEST FOR ALL MATERIALS USED CONTAINING ORGANIC SOLVENTS.
4. IF A SOLVENT FLOW IS UTILIZED, ONLY A CONTINUOUS FLUID STREAM SHALL BE USED, (NOT A FINE, ATOMIZED, OR SHOWER-TYPE SPRAY). THE STREAM PRESSURE SHALL BE LOW ENOUGH TO PREVENT LIQUID SPLASHING OUTSIDE THE CONTAINER.
5. THE PERMITTEE SHALL PROVIDE ACCESS, FACILITIES, UTILITIES AND ANY NECESSARY SAFETY EQUIPMENT FOR INSPECTION AND SOURCE TESTING UPON REQUEST OF THE AIR POLLUTION CONTROL DISTRICT.
6. THE LESSEE SHALL OPERATE THE REMOTE RESERVOIR SOLVENT CLEANER IN COMPLIANCE WITH THE APPLICABLE SAN DIEGO AIR POLLUTION CONTROL DISTRICT OPERATING REQUIREMENTS AS POSTED ON THE EQUIPMENT. INDUSTRIAL SOLVENT & CHEMICAL CO SHALL BE RESPONSIBLE FOR COMPLIANCE WITH ALL APPLICABLE EQUIPMENT REQUIREMENTS OF RULE 67.6.
7. SOLVENT CLEANER OPERATORS SHALL MAINTAIN INDUSTRIAL SOLVENT & CHEMICAL CO SERVICE RECORDS OF THE TYPES, AMOUNTS, AND DATES OF SOLVENTS ADDED TO AND REMOVED FROM EACH SOLVENT CLEANER. THE RECORDS SHALL BE MAINTAINED FOR THREE (3) YEARS AND MADE AVAILABLE TO THE AIR POLLUTION CONTROL OFFICER IMMEDIATELY UPON REQUEST.
8. OPERATION MUST BE IN COMPLIANCE WITH ALL INFORMATION INCLUDED IN APPLICATIONS FOR THIS PERMIT TO OPERATE, AS APPROVED BY THE DISTRICT, AND WITH ALL CONDITIONS LISTED ABOVE.

WITHIN 10 DAYS AFTER RECEIPT OF THIS PERMIT, THE APPLICANT MAY PETITION THE HEARING BOARD TO REVIEW ANY CONDITION THAT HAS BEEN MODIFIED OR ADDED TO THE PERMIT. (RULE 25 AND REGULATION V)

IN ACCORDANCE WITH RULE 10C THIS PERMIT TO OPERATE OR A COPY MUST BE POSTED ON OR WITHIN 25 FEET OF THE EQUIPMENT, OR MAINTAINED READILY AVAILABLE AT ALL TIMES ON THE OPERATING PREMISES.

ANY AND ALL CONDITIONS WHICH HAVE BEEN APPLIED TO THIS EQUIPMENT SHALL REMAIN IN FULL FORCE AND EFFECT UNLESS EXPRESSLY MODIFIED BY THE AIR POLLUTION CONTROL DISTRICT.

THIS AIR POLLUTION CONTROL DISTRICT PERMIT DOES NOT RELIEVE THE HOLDER FROM OBTAINING PERMITS OR AUTHORIZATIONS WHICH MAY BE REQUIRED BY OTHER GOVERNMENTAL AGENCIES.

R.J. Sommerville
AIR POLLUTION CONTROL OFFICER

APPENDIX D

AN OVERVIEW OF THE DEPARTMENT OF TOXIC SUBSTANCES CONTROL (DTSC)

TOXICS
AND
HAZARDOUS WASTES INFORMATION
INCLUDING
TOXIC AIR CONTAMINANT IDENTIFICATION LIST

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

OVERVIEW OF THE DEPARTMENT OF TOXIC SUBSTANCES CONTROL

The mission of the California Department of Toxic Substances Control (Department) is to protect and enhance public health and the environment by regulating the management of hazardous waste and promoting reduction of such waste.

The Department is responsible for implementing and enforcing provisions of the State's Hazardous Waste Control Law (HWCL), Chapter 6.5 of the Health and Safety Code (HSC), and the Hazardous Substances Account Act (HSAA), Chapter 6.8 HSC, and pursuant regulations (Title 22, Division 4.5, California Code of Regulations [CCR]).

To carry out this mission, the Department administers four major programs: Hazardous Waste Management; Site Mitigation; Legal Counsel and Criminal Investigations, and Pollution Prevention.

- The Hazardous Waste Management Program (HWMP) is an integration of several program functions: permitting, enforcement, waste classification, and treatment standards. This configuration is designed to ensure environmental protection and, at the same time, address the concerns of business in a timely manner. The Statewide Compliance Division within HWMP performs facility inspections, responds to complaints, and takes necessary enforcement actions under administrative, civil, and criminal authorities. The permitting program issues required permits to hazardous waste treatment, storage, and disposal facilities. The State Regulatory Program Division performs inspections of generators and lower tiers, conducts complaint investigations, and acts as local county liaison.

- The Site Mitigation Division functions are aligned to provide the most effective coordination of the Department's hazardous waste site cleanup resources. A major emphasis of this program is responsible party involvement in site cleanup and cost recovery.

- The Criminal Investigations Branch (CIB), a function within the Office of Legal Counsel and Criminal Investigation, is staffed with sworn peace officers with the powers of arrest, search, and seizure. The CIB is charged primarily with investigating alleged criminal violations of the HWCL and routinely pursue a wide range of both felony and misdemeanor cases. Investigators also assist HWMP more complex civil and administrative cases and also assist other State, local, and federal law enforcement agencies in development of criminal cases.

- The Pollution Prevention, Public and Regulatory Assistance Program includes pollution prevention/waste minimization, technology development, industry and small business assistance, as well as community relations and public participation. This programs' responsibilities include establishing a program for hazardous waste source reduction.

Staff in the above four programs are divided geographically into four regional offices, with a field office in Clovis, and headquarters in Sacramento. A recent version of the Department's organization chart is included as Attachment A and a Regional Map is included as Attachment B.

ENFORCEMENT AUTHORITY

As previously stated, the Department is responsible for implementing and enforcing provisions of the State's HWCL (Chapter 6.5 HSC) and the HSAA (Chapter 6.8 HSC) and pursuant regulations (Title 22, CCR). The Department utilizes three basic types of enforcement: administrative, civil, and criminal. The following HSC sections contain the Department's enforcement authority:

Basic Authority

The Department's basic authority for hazardous waste enforcement is found in HSC Section 25180 - Mandates that the Department enforce provisions of Chapter 6.5 and any regulations adopted by the Department.

Administrative

Chapter 6.5 HSC (HWCL)

25186 - Denial, Suspension, Revocation of Permit - The Department may deny, suspend, or revoke any permit, registration, or certificate applied for or issued for violations of Chapter 6.5, 6.7, 6.8, etc.

25187 - Administrative Authority to enforce HWCL - The Department has developed different processes for issuing these orders, depending on the severity or the violations to be addressed. These include Enforcement Orders, Desk Orders, and Field Orders (a.k.a. Toxi-Tickets). These orders typically mandate a return to compliance and payment of a penalty. Since 1988, the Department has issued over 600 administrative enforcement actions and collected over $15 million.

25187.6 - Quarantine Order - The Department may issue an order to quarantine, for 30 days, any hazardous waste that the Department has probable cause to believe is handled in violation of Chapter 6.5 and threaten the public health and safety.

25189.2(b) - Penalties - Authority for imposing civil penalties of up to $25,000 per day per violation. The penalties range from a low of a $50 Field order for a mislabeled drum or incomplete manifest to an $8.95 million Enforcement Order with multiple violations including 6,000 illegally stored drums of waste.

25244.21 - Allows the Department to impose a $1,000 per day administrative penalty for incomplete waste minimization plans or for failure to respond to a request by the Department for a waste minimization plan.

Chapter 6.8 HSAA

25355.5 - Remedial Action Orders (RAO) - The Department may issue an RAO establishing a schedule of compliance with specific dates for removing or remediating the hazardous substances release site.

25358.3 - Imminent and Substantial Endangerment Order (I/SE)- These Orders are issued to encourage/compel responsible party clean-up efforts. Under this section, the Department can issue I/SE orders to responsible parties to take appropriate removal or remedial action at those sites which the Department has determined pose an imminent and/or substantial endangerment to the environment or the people of the State.

25359.2 - Establishes a penalty, civil or administrative, of $25,000 per day for non-compliance with an RAO or a I/SE order.

25359.3 - Allows the Department to take administrative action upon a responsible party that fails to comply with an RAO or I/SE order or who releases, allows, or causes a release. The section also specifies the time frames for the administrative process.

25359.4 - Establishes a $25,000 per day per violation on any person who releases, allows, or causes a release of a hazardous substance.

25359.5 - Fence and Post Order - After making a determination that there has been a release of a hazardous substance, the Department may order a property owner to secure a site as specified in the order.

Civil and Criminal Referrals - These options are generally used for more serious violations such as those involving cross media and criminal behavior. Since 1988, the Department has made over 105 civil referrals to the Attorney General and 137 referrals to District Attorneys.

Civil

Chapter 6.5 HSC (HWCL)

25181 - Civil Action for Injunctive Relief - Allows the Department to make civil referrals to the Attorney General, City Attorney, and District Attorney to make application to the superior court for an order enjoining violations of the HWCL, or for an order directing compliance, or a permanent or temporary injunction, restraining order, or other order.

25189.2(b) - Civil Penalty - Authority for imposing civil penalties of up to $25,000 per day per violation of any permit rule, standard, or requirement issued pursuant to the HWCL.

25189.2(a) - Civil action for penalties up to $25,000 per violation per day for making a false statement in a document required by the HWCL.

25189.2(c) - Illegal Disposal - Civil action for penalties up to $25,000 per day per violation for disposing or causing disposal of a hazardous waste at an unauthorized point.

25189 - Intent/Neglect - Civil action for penalties up to $25,000 per day per violation for any of the above violations when intentional or result of negligence.

Chapter 6.8 - HSAA

25367 - Allows the Department to seek treble damages and civil penalties or $25,000 per day or non-compliance with an I/SE order or for failure to provide information under 25358.1(a)(2).

25360 - Allows the Department, through a civil action filed with the Attorney General, to recover any costs incurred from the Hazardous Substance Account (HSA) or the Hazardous Substance Cleanup Fund.

25359.4 - Unauthorized Release - Any person who releases, allows a release, or causes a release not authorized or permitted pursuant to state law shall be liable for a penalty up to $25,000 per day of violation.

Criminal

Chapter 6.5

25189.5(a)(b) - Unauthorized Disposal - Allows the court to impose a sentence of up to 1 year in a county jail or 16, 24, 36 months in prison on a person who knowingly/reasonably should have known - disposed or causing disposal of hazardous waste at an unpermitted facility or unauthorized point. The section mandates the court to impose a $5,000 - $100,000 fine per day of violation for the preceding violations.

25189.5(c) - Unauthorized Transport - Allows the court to impose a sentence of 1 year in a county jail or 16, 24, 36 months in prison on a person who knowingly/ reasonably should have known transported or causing transport of hazardous waste at an unpermitted facility or unauthorized point. The section mandates the court to impose a $5,000 - $100,000 fine per day of violation for the preceding violations.

25189.5(d) - Unauthorized Treatment or Storage - Allows the court to impose a sentence of 1 year in a county jail or 16, 24, 36 months in prison on a person who knowingly treats or stores a hazardous waste at an unpermitted facility or unauthorized point.

25189.5(e) - Personal Injury or Death - Allow the court to impose an additional 36 months for acts under 25189.5 (b),(c) or (d) causing great bodily injury or substantial probability of death. The penalty in this situation is between $5,000 - $250,000 per day.

25189.6(a) - Knowingly or with reckless disregard for the risk, treats, handles, transports, disposes, or stores in a manner which creates unreasonable risk or fire, explosion, serious injury, or death. Under this section, the court may impose a sentence of 1 year in a county jail or 16, 24, 36 months in state prison and/or a $5,000 to $250,000 per day fine.

25189.6(b) - In committing the act in 25189.6(a), knowingly at the time that another person in imminent danger of death or bodily injury. Under this section, the court may impose a sentence of 3, 6, or 9 years in state prison and a $5,000 to $250,000 per day fine.

25189.7 - Burning or incineration of any hazardous waste at a point not authorized. Under this section, the court shall impose a sentence of up to 1 year in a county jail or 16, 24, 36 months in state prison and/or a $5,000 to $100,000 per day fine. If the act causes great bodily injury or causes the probability of death, the court may impose a sentence up to 36 months in state prison in addition to any other term and may be fined up to $250,000/day.

25190 - HWCL Violation - Violation of any section of HWCL or any permit, rule regulation, standard, or requirement issued or adopted pursuant to HWCL is guilty of a misdemeanor, fined up to $1,000, or 6 months imprisonment in jail or both. For subsequent violation, the court shall impose a sentence of 1 year in a county jail or 16, 20, 24 months in state prison and a $5,000 to $2500 fine.

25191(a)(1) - Fraudulent Document - Knowingly making a false statement or representation in any application, label, manifest, record, report, permit, or other document required by the HWCL. The court shall impose a fine $2,000 and $25,000 per day of violation and/or 1 year imprisonment in jail. Subsequent violations - 16, 20, 24 months in prison or 1 year in jail and/or a fine between $2,000 and $50,000 per day.

25191(a)(2) - Knowing possession of any record required relating to generation, storage, treatment, transportation, disposal, or handling that has been altered or concealed. The court shall impose a fine $2,000 and $25,000 per day of violation and/or 1 year imprisonment in jail. Subsequent violations - 16, 20, 24 months in prison or 1 year in jail and/or a fine between $2,000 and $50,000 per day.

25191(a)(3) - Knowingly destroys, alters, or conceals any required document. The court shall impose a fine $2,000 and $25,000 per day of violation and/or 1 year imprisonment in jail. Subsequent violations - 16, 20, 24 months in prison or 1 year in jail and/or a fine between $2,000 and $50,000 per day.

25191(a)(4) - Knowingly withholds information regarding real and substantial danger to public health or safety when information is requested and required for Department use. The court shall impose a fine $2,000 and $25,000 per day of violation and/or 1 year imprisonment in jail. Subsequent violations - 16, 20, 24 months in prison or 1 year in jail and/or a fine between $2,000 and $50,000 per day.

25191(a)(5)(6)(7)(8) - Unregistered, Unmanifested Transport - Knowingly transportation in violation of manifest and registration provisions. The court shall impose a fine $2,000 and $25,000 per day of violation and/or 1 year imprisonment in jail. Subsequent violations - 16, 20, 24 months in prison or 1 year in jail and/or a fine between $2,000 and $50,000 per day.

25160(d), 25191(c)(2) - Transporting hazardous waste in a vehicle without a manifest. The court shall impose a fine up to $500 per day and/or imprisonment in jail up to 6 months.

25195, Penal Code 19 - Willfully interfering with, or attempting to impede enforcement of the HWCL, examination of records, or preservation of evidence. The court may impose a fine up to $1,000 per day and/or imprisonment in jail up to 6 months.

25299(d) - Underground Storage Tank - Any person who falsifies any monitoring records required by HSC Chapter 6.7 or knowingly fails to report an unauthorized release. The court shall impose a fine between $5,000 and $10,000 and/or up to 1 year in jail.

25515, 25507 - Either failure to notify the administrating agency as required in 255207 of a release or threaten release of hazardous material or failure to allow access to emergency personnel access to the facility. The court shall impose a fine up to $50,00/day and/or 1 year in jail or 16, 20, 24 months in prison.

Under Title 22 Sections 66263.13 and 66263.23, the Department may enforce certain provisions of Title 13 pertaining to the condition of vehicles and containers used to transport hazardous waste.

ENFORCEMENT STAFF

As previously mentioned, the Department has four major programs located in four regional offices and headquarters. Within each program, specific branches take enforcement.

The HWMP is charged with implementing Chapter 6.5 of the HSC, otherwise known as the Hazardous Waste Control Law (HWCL). Under the HWMP, the principle mission is to maintain an effective evaluation and enforcement presence that routinely assesses the regulated community's compliance with the laws and regulations concerning hazardous waste management, and to initiate any necessary enforcement actions to promote compliance and ensure correction of identified violations. This function is carried out by 180 enforcement staff distributed among four regional offices, two statewide programs at headquarters, and a support unit.

Regional field activities include routine facility inspections, enhanced surveillance at commercial disposal facilities, complaint response, California-Mexico border hazardous waste monitoring, and enforcement of violations found during these activities. The regions' activities also include working cooperatively with inspection and enforcement activities of local agencies, U.S.EPA, and other Cal/EPA agencies in focused enforcement actions that cross regional and program boundaries. Regional staff also oversee some small site cleanups.

The Manifest Enforcement Unit and the Transportation Unit located at headquarters are involved in statewide enforcement activities. The Transportation Unit's role is to ensure that businesses who transport hazardous waste are capable of performing this task in a safe legal and responsible manner, and the actual vehicles used can safely transport the waste.

The Manifest Enforcement Unit, created July 1, 1992, uses HAZNET (formerly the Hazardous Waste Information System), a computerized tracking system that tracks hazardous waste from generator to disposal, to detect violations of the HWCL. Since July 1, 1992, the Manifest Enforcement Unit has issued over 300 administrative enforcement actions.

The Site Mitigation Division is charged with implementing Chapter 6.8 of the HSC, otherwise known as the HSAA. The HSAA was established to provide the State with a program to respond to releases of hazardous substances that pose a threat to the public health and environment; to compensate persons, under certain circumstances, for out-of-pocket medical expenses and lost wages from injuries caused by exposure to releases of hazardous substances; and to provide the State's match for cleanup of federal National Priority List sites. The Site Mitigation Program is also responsible for overseeing the cleanup of hazardous substances release sites funded by responsible parties.

The Pollution Prevention and Regulatory Assistance Program is charged with implementing a broad variety of Statewide programs within the Department which are required by the Health and Safety Code including the Hazardous Waste Source Reduction and Management Review Act of 1989, found under Article 11.9, Chapter 6.5 Section 25244.12 et seq. of the HSC. Under this Article, the Department has authority to call in selected plans and reports required of generators by this Article and review them for compliance. The Department is also given authority to request plans and reports during onsite inspections.

COORDINATION WITH OTHER AGENCIES

State Water Resources Control Board (SWRCB) and Regional Water Quality Control Boards (RWQCB)

In many areas, the Department's authority coincides with the jurisdiction of the State and Regional Water Boards to protect water quality. Provisions in the HSC ensure that the Department's enforcement actions recognize and implement appropriate water quality standards adopted by the State and Regional Water Quality Boards (HSC 25187).

The Department has a Memorandum of Understanding (MOU) with the SWRCB. The MOU defines the relationship between the Department and the SWRCB and RWQCB regarding the cleanup of hazardous waste sites. The MOU provides the procedure for determining the lead agency and spells out the responsibilities of the lead and support agencies.

California Integrated Waste Management Board (CIWMB)

An MOU between the Department and the CIWMB defines the relationship between the two agencies in the regulation of asbestos containing waste at non-class 1 landfills.

The Department also performs annual inspections at used-oil recyclers for the CIWMB as specified in AB 2076 to provide the CIWMB with information needed to certify used oil recycling facilities.

Additionally, the Department works closely with CIWMB with developing regulations and statutes concerning hazardous waste at landfills.

The Department also refers complaints concerning solid waste not otherwise regulated as hazardous waste to the CIWMB, and accepts complaints from the CIWMB regarding illegal management of hazardous waste.

Air Resources Board (ARB)

An MOU exists between the Department and the ARB to define roles and responsibilities and coordinating efforts in the issuing permits, establishing air emission standards, etc. for hazardous waste facilities and cleanup sites.

Additionally, the Department's enforcement staff will notify the ARB if they discover illegal discharges to the air, not otherwise regulated by the Department, while conducting an inspection or a complaint response. The Department will also refer "air pollution" complaints it receives to the ARB or appropriate Air Quality Management District.

Office of Environmental Health Hazard Assessment (OEHHA)

The Department serves as the collecting point for all Proposition 65 reports from other State agencies and enters them into a tracking system before transmittal to OEHHA.

Department Of Pesticide Regulation (DPR)

The Department works closely with DPR on issues relating to the regulation of pesticides and related containers as hazardous waste. Most recently, the Department has worked closely with DPR developing the pesticide collection program.

Local Agencies

Local Health Officers also have statutory authority to enforce the HWCL and pursuant regulations. The Department has entered into MOU's with local agencies to recognize the agency's authority and to coordinate inspection and enforcement activities with each agency. In general, local agencies concentrate their resources on generator inspections and complaint response. The Department provides coordination, guidance, and technical training. Surveillance and Enforcement staff meet regularly with local agencies to discuss inspections, enforcement, new statutes and regulations, and other issues of concern.

United States Environmental Protection Agency (U.S.EPA)

In July 1992, the Department received authorization to administer the federal RCRA program. The Department works closely with the U.S.EPA in coordinating inspections and enforcement.

Other Functions

In addition to the above functions, the Department maintains a statewide toll free telephone number (1-800-69-TOXIC) for hazardous waste complaints, as well as an informant reward program. If necessary, complaints are referred to the above agencies. The Department also provides technical assistance, as resources allow, to the above agencies in multi-media enforcement actions.

Recognizing Hazardous Waste and Potential Violations

Staff in other Cal/EPA agencies can be valuable in identifying potential hazardous waste violations. To do this, they will need some understanding of what is a hazardous waste. Basically, there are four criteria that make a waste a hazardous waste. These are: *ignitability, corrosivity, reactivity,* and *toxicity*. Other definitions also apply.

The ignitability criteria is defined in CCR Section 66261.21. Any waste liquid with a flash point of less than 60^oC (140^o F) is ignitable, and therefore hazardous. Solids capable of causing fire through friction, absorption of moisture, and other factors are also ignitable. Ignitable compressed gasses (see 49 FR 173.300) and oxidizers (see 49 CFR 173.151) are also ignitable.

The corrosivity characteristic is defined in CCR Section 66261.22. Any liquid aqueous waste with a pH less than or equal to 2 or greater than or equal to 12.5 is corrosive, and therefore hazardous. A few other criteria are included.

The characteristic of reactivity is defined in CCR Section 66261.23. This definition deals with wastes that are normally unstable, explosive, react violently with water, are capable of detonating at standard temperature and pressure, are explosives, or that are sulfide or cyanide bearing waste that can generate toxic gasses, vapors, or fumes when exposed to pH conditions between 2 and 12.5.

The characteristic of toxicity is defined in CCR Section 66261.24, and is the most complex of all the characteristics. There are specified levels of certain constituents, singly or in combination, that would make a waste hazardous. There are also specified levels at which the combined toxicity (as indicated by LD_{50} or LC_{50} calculations from scientific literature) of single or multiple constituents would make the waste hazardous.

In addition to the above characteristics, there are specific sources, or processes, which produce wastes that are identified as hazardous. These are generally known as "listed wastes", since they are specifically listed in the regulations. These include non-specific sources such as spent solvents, electroplating sludge, and used oil, as well as very specific industrial process sources in such as distillation bottoms from the production of aniline.

Any material which would be considered hazardous will, in all likelihood, be considered hazardous as a waste. All hazardous waste must be properly labelled, whether in tanks or containers. It must be managed according to strict requirements, and all those generating or managing hazardous waste must meet training and emergency preparation requirements. Transportation of hazardous waste must be carried out by registered transporters, and the loads of waste must be accompanied by a hazardous waste manifest.

In any situation where you suspect illegal handling of hazardous waste, you should obtain as much information about the nature of the material, and about the way it is being managed. This information can be forwarded to any of the Department's offices as a complaint and it will be investigated. The information can be reported through the Toxic Hotline at 1-800-69-TOXIC, which automatically directs the caller to the appropriate department regional office.

ENFORCEMENT RESPONSE GOALS

- To return violator to compliance
- To promote compliance among regulated community
- To penalize violator
- To recover economic benefit gained
- To treat regulated community consistently
- To resolve enforcement action in a timely manner

THREE SIGNIFICANT HAZARDOUS WASTE VIOLATIONS

1. UNLAWFUL TRANSPORTATION OF HAZARDOUS WASTE
2. UNAUTHORIZED STORAGE OF HAZARDOUS WASTE
3. UNLAWFUL DISPOSAL OF HAZARDOUS WASTE

ELEMENTS
HEALTH AND SAFETY CODE
SECTION 25189.5(B)

1. Any person
2. Knowingly or reasonably should have known
3. Disposing or causing the disposal
4. a) Hazardous
   b) Waste
5. Unpermitted facility or unauthorized point

ELEMENTS
HEALTH AND SAFETY CODE
SECTION 25189.5(c)

1. Any person
2. Knowingly or reasonably should have known
3. Transporting or causing the transportation
4. a) Hazardous
   b) Waste
5. To an unpermitted facility or unauthorized point

UNAUTHORIZED STORAGE
HSC 25201(a)

Generator stores hazardous waste without authorization if:

1. The material is a waste that is hazardous.
2. The hazardous waste is stored in containers or tanks.
3. The hazardous waste is stored longer than 90 days from the date of initial accumulation.
4. The hazardous waste is stored in an unauthorized area.
5. The hazardous waste is stored offsite without authorization or exemption.

ELEMENTS
HEALTH AND SAFETY CODE
SECTION 25189.5(d)

1. Any person
2. Knowingly
3. Treats or stores
4. a) Hazardous
   b) Waste
5. Unpermitted facility or unauthorized point

Toxic Air Contaminant Identification List
April 1993

I. Substances identified as Toxic Air Contaminants by the Air Resources Board, pursuant to the provisions of AB 1807 and AB 2728 (includes all Hazardous Air Pollutants listed in the Federal Clean Air Act Amendments of 1990).

- Acetaldehyde
- Acetamide
- Acetonitrile
- Acetophenone
- 2-Acetylaminofluorene
- Acrolein
- Acrylamide
- Acrylic acid
- Acrylonitrile
- Allyl chloride
- 4-Aminobiphenyl
- Aniline
- o-Anisidine
- *Asbestos
- *Benzene (including benzene from gasoline)
- Benzidine
- Benzotrichloride
- Benzyl chloride
- Biphenyl
- Bis(2-ethylhexyl)phthalate (DEHP)
- Bis(chloromethyl)ether
- Bromoform
- *1,3-Butadiene
- *Cadmium (metallic cadmium and cadmium compounds)
- Calcium cyanamide
- Caprolactam
- Captan
- Carbaryl
- Carbon disulfide
- *Carbon tetrachloride
- Carbonyl sulfide
- Catechol
- Chloramben
- Chlordane
- Chlorine
- *Chlorinated dioxins and dibenzofurans (15 species)
- Chloroacetic acid
- 2-Chloroacetophenone
- Chlorobenzene
- Chlorobenzilate
- *Chloroform
- Chloromethyl methyl ether
- Chloroprene
- *Chromium VI
- Cresols/Cresylic acid (isomers and mixture)
- o-Cresol
- m-Cresol
- p-Cresol
- Cumene
- 2,4-D, salts and esters
- DDE
- Diazomethane
- Dibenzofurans
- 1,2-Dibromo-3-chloropropane
- Dibutylphthalate
- 1,4-Dichlorobenzene(p)
- 3,3-Dichlorobenzidene
- Dichloroethyl ether (Bis(2-chloroethyl)ether)
- 1,3-Dichloropropene
- Dichlorvos
- Diethanolamine
- N,N-Diethyl aniline (N,N-Dimethylaniline)
- Diethyl sulfate
- 3,3-Dimethoxybenzidine
- Dimethyl aminoazobenzene
- 3,3-Dimethyl benzidine
- Dimethyl carbamoyl chloride
- Dimethyl formamide
- 1,1-Dimethyl hydrazine
- Dimethyl phthalate
- Dimethyl sulfate
- 4,6-Dinitro-o-cresol, and salts
- 2,4-Dinitrophenol
- 2,4-Dinitrotoluene
- 1,4-Dioxane (1,4-Diethyleneoxide)
- 1,2-Diphenylhydrazine
- Epichlorohydrin (1-Chloro-2,3-epoxypropane)
- 1,2-Epoxybutane
- Ethyl acrylate
- Ethyl benzene
- Ethyl carbamate (Urethane)
- Ethyl chloride (Chloroethane)
- *Ethylene dibromide (Dibromoethane)
- *Ethylene dichloride (1,2-Dichloroethane)
- Ethylene glycol
- Ethylene imine (Aziridine)
- *Ethylene oxide
- Ethylene thiourea
- Ethylidene dichloride (1,1-Dichloroethane)
- *Formaldehyde
- Heptachlor
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- Hexachloroethane
- Hexamethylene-1,6-diisocyanate
- Hexamethylphosphoramide
- Hexane
- Hydrazine
- Hydrochloric acid
- Hydrogen fluoride (Hydrofluoric acid)
- Hydroquinone
- *Inorganic arsenic
- Isophorone
- Lindane (all isomers)
- Maleic anhydride
- Methanol
- Methoxychlor
- Methyl bromide (Bromomethane)
- Methyl chloride (Chloromethane)
- Methyl chloroform (1,1,1-Trichloroethane)
- Methyl ethyl ketone (2-Butanone)
- Methyl hydrazine
- Methyl iodide (Iodomethane)
- Methyl isobutyl ketone (Hexone)
- Methyl isocyanate
- Methyl methacrylate
- Methyl tert butyl ether
- 4,4-Methylene bis(2-chloroaniline)
- *Methylene chloride (Dichloromethane)
- Methylene diphenyl diisocyanate (MDI)
- 4,4–Methylenedianiline
- Naphthalene
- *Nickel and nickel compounds
- Nitrobenzene
- 4-Nitrobiphenyl
- 4-Nitrophenol
- 2-Nitropropane
- N-Nitroso-N-methylurea
- N-Nitrosodimethylamine
- N-Nitrosomorpholine
- Parathion
- Pentachloronitrobenzene (Quintobenzene)
- Pentachlorophenol
- Phenol
- p-Phenylenediamine
- Phosgene
- Phosphine
- Phosphorus
- Phthalic anhydride
- Polychlorinated biphenyls (Aroclors)
- 1,3-Propane sultone

Category I Continued

beta-Propiolactone
Propionaldehyde
Propoxur (Baygon)
Propylene dichloride
(1,2-Dichloropropane)
Propylene oxide
1,2-Propylenimine (2-Methyl aziridine)
Quinoline
Quinone
Styrene
Styrene oxide
2,3,7,8-Tetrachlorodibenzo-p-dioxin
1,1,2,2-Tetrachloroethane
***Tetrachloroethylene**
(Perchloroethylene)
Titanium tetrachloride
Toluene
2,4-Toluene diamine
2,4-Toluene diisocyanate
o-Toluidine
Toxaphene (chlorinated camphene)
1,2,4-Trichlorobenzene
1,1,2-Trichloroethane
***Trichloroethylene**
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
Triethylamine
Trifluralin
2,2,4-Trimethylpentane
Vinyl acetate
Vinyl bromide
***Vinyl chloride**
Vinylidene chloride
(1,1-Dichloroethylene)
Xylenes (isomers and mixture)
o-Xylenes
m-Xylenes
p-Xylenes
o Antimony Compounds
o Arsenic Compounds (inorganic including arsine)
o Beryllium Compounds
o Cadmium Compounds
o Chromium Compounds
o Cobalt Compounds
o Coke Oven Emissions
o Cyanide Compounds[1]
o Glycol Ethers[2]
o Lead Compounds
o Manganese Compounds
o Mercury Compounds
o Fine mineral fibers[3]
o Nickel Compounds
o Polycyclic Organic Matter[4]
o Radionuclides (including radon)[5]
o Selenium Compounds

* *Substances which have already been identified by the Board as TACs and which have potency numbers developed by the OEHHA and SRP.*

II. Substances currently under review or nominated for review for identification as Toxic Air Contaminants.

A. Substances already in the review process.

Diesel exhaust
Inorganic lead

B. Substances nominated for review.

Dialkylnitrosamines
Environmental Tobacco Smoke

III. Substances which are being evaluated for entry into Category II (IIA or IIB). Factors considered in this evaluation include carcinogenic and noncarcinogenic health effects, emissions and exposure in California.

Acetone
Aluminum
Ammonia
Ammonium nitrate
Ammonium sulfate
Barium compounds
Benzoyl chloride
Bis(2-ethylhexyl) adipate
Bromine compounds (inorganic)
Butyl acrylate
Butyl benzyl phthalate
Carbon black extracts
Chlorinated fluorocarbons
Chlorine dioxide
Chlorophenols
Copper compounds
Creosotes
Crystalline silica
Cumene hydroperoxide
Cyclohexane
Decabromodiphenyl oxide
Diaminotoluene (mixed isomers)
Dicofol
Gasoline vapors
Glutaraldehyde
Hexachlorocyclohexanes
Hydrogen sulfide
Isopropyl alcohol
4,4'-Isopropylidenediphenol
Molybdenum trioxide
n-Butyl alcohol
Nitric acid
Nitrilotriacetic acid
Peracetic acid
2-Phenylphenol
Phosphoric acid
Propene
sec-Butyl alcohol
Silver compounds
Sodium hydroxide
Sulfuric acid
Terephthalic acid
tert-Butyl alcohol
Thiourea
1,2,4-Trimethylbenzene
Zinc compounds

Note: For all listing above which contain the word "compounds" and for glycol ethers, the following applies: Unless otherwise specified, these listings are defined as including any unique chemical substance that contains the named chemical (i.e., antimony , arsenic, etc) as part of that chemical's infrastructure.

1 *X'CN where X=H' or any other group where a formal dissociation may occur. For example KCN or* $Ca(CN)_2$

2 *includes mono- and di-ethers of ethylene glycol, diethylene glycol, and triethylene glycol (*$R(OCH_2CH_2)_n$*-OR' where*
n = 1,2 or 3
R = alkyl or aryl groups
R' = R, H, or groups which, when removed, yield glycol ethers with the structure; $R(OCH_2CH)_n$*-OH. Polymers are exluded from the glycol category.*

3 *includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less.*

4 *includes organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to* 100^0*C.*

5 *a type of atom which spontaneously undergoes radioactive decay.*

On April 8, 1993, the Board identified all federal hazardous air pollutants (HAPs) as toxic air contaminants (TACs).

GUIDANCE DOCUMENT
For The
HALOGENATED SOLVENT CLEANER NESHAP

A
USEPA REPORT

(Appendices are not provided here, due to space limitations.)

EPA-453/R-94-081

Guidance Document for the Halogenated Solvent Cleaner NESHAP

Sponsored by:

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

Federal Small Business Assistance Program
Control Technology Center
Information Transfer and Program Integration Division (ITPID)
Office of Air Quality Planning and Standards
U. S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

April 1995

Disclaimer

This report is not a legally binding document, and is not meant to replace the published regulation titled "National Emission Standards for Hazardous Air Pollutants (NESHAP): Halogenated Solvent Cleaning" (Federal Register, 12/02/94, beginning on page 61801). This document presents specific aspects of the regulation and may not cover all parts of the regulation. This document is an elaboration of the appropriate legal document, and the final authority rests solely in the legal document.

[The ARB/CAP staff have reformatted this document to fit on fewer pages in order to include the body of it in an appendix of their Solvents Technical Manual.]

Contents

Part One: Does This Rule Apply to You?
Part Two: Halogenated Solvent Cleaning Requirements

Part 3: Alternatives to Halogenated Solvent Cleaning

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[Appendices Not Extracted for California ARB/CAP Solvents Technical Manual -- Due to space limitations]

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APPENDICES

Tables

Introduction

The purpose of this document is to give owners and operators of solvent cleaning machines the information required to determine whether the halogenated solvent cleaning regulation applies to them, and the options available to comply. This guidance document is divided into three parts:

- Determining if you are required to comply with the Federal halogenated solvent cleaner requirements (Part One);
- The available compliance options (Part Two); and
- Alternative cleaning solvents or technologies that can be used in lieu of complying with the standards (Part Three).

Part One of this document contains information to assist you in determining whether the rule affects you.

Part Two of this document provides an overview and step by step instructions on what you need to know and do to comply with the rule. Section 1.0 provides direction on what you need to know about your machine(s) to determine what part of the rule you are subject to and to determine compliance. Section 2.0 presents requirements under the NESHAP if you own or operate a batch vapor or an in-line (vapor or cold) machine; and Section 3.0 presents requirements under the NESHAP if you own or operate a batch cold machine.

Part Three of this document provides information on solvents and cleaning processes that can be used as alternatives to halogenated solvent cleaning. Specifically, Part Three includes the following information:

- Guidance materials and tools available to assist you in determining what alternatives to halogenated solvent cleaning are available.
- A list of factors that should be considered when evaluating halogenated solvent cleaning alternatives.

This document also includes a glossary, unit conversion chart, and numerous appendices. These appendices provide additional information, including:

- Detailed calculations for key compliance issues,
- Blank example forms that can be used to record and report compliance,
- The operator test,
- Work practice requirement posters that can be used in the work place to encourage proper cleaning procedures, and
- The U.S. Environmental Protection Agency (EPA) regional office contact numbers.

Does This Rule Apply to You?

The halogenated solvent cleaner NESHAP rule applies to you if you own or operate a solvent cleaning machine that uses a solvent that contains 5 percent or more by weight of any one or any combination of the following halogenated solvents:

- Carbon tetrachloride
  (CAS No. 127-18-4),

- Chloroform,
  (CAS No. 67-66-3),

- Perchloroethylene
  (CAS No. 127-18-4),

- 1,1,1-Trichloroethane
  (CAS No. 71-55-6),

- Trichloroethylene
  (CAS No. 79-01-6), and/or
- Methylene chloride
  (CAS No. 75-09-2).

In the rule, the definition of solvent cleaning machine <u>excludes</u> small buckets, pails, and beakers with capacities less than 7.6 liters (2 gallons). Therefore, containers of this type using halogenated solvents are not covered by the requirements of this rule.

This rule applies to you if...

◉ You are an owner or operator of a solvent cleaning machine; and

◉ You use a solvent in your machine that contains (in total) 5 percent by weight or more of any of the following regulated solvents: carbon tetrachloride, chloroform, perchloroethylene, 1,1,1-trichloroethane, trichloroethylene, or methylene chloride.

Generally, the listed solvents (when used in cleaning operations) are used in amounts much greater than 5 percent by weight. In fact, many operations use the listed solvents in amounts greater than 75 percent by weight. If your halogenated solvent content is greater than 5 percent by weight, no documentation is required to demonstrate the solvent content.

Stoddard solvents and naphthas generally contain less than 5 percent by weight halogenated solvent and will not typically be subject to this rule.

The material safety data sheets (MSDSs) for these solvents should provide sufficient documentation of solvent content.

In a few instances, a solvent may be used that is close to the 5 percent cut-off level. In these cases, documentation such as that explained in Appendix A, is required to demonstrate that your solvent meets this limit. For further guidance on the determination and example record format that can be used for documentation, see Appendix A. Documentation should be kept on-site; no reporting is required.

Halogenated Solvent Cleaning Requirements

PART TWO

1.0 To Determine Your Compliance Options You Need to Know...

Once you have determined that the rule applies to you, you need to identify the available compliance options. The following steps outline what you need to know about your machine(s) to identify your compliance options.

1. Determine the type of solvent cleaning machine(s) you own or operate. There are three basic types of machines covered by this regulation: **batch vapor, batch cold**, and **in-line** (in-line cold and in-line vapor) machines (see Section 1.1).

2. If your machine is a batch vapor or in-line machine, determine the machine's solvent-air interface area. This is necessary because some of the requirements for these machines are dependent on machine size (see Section 1.2).

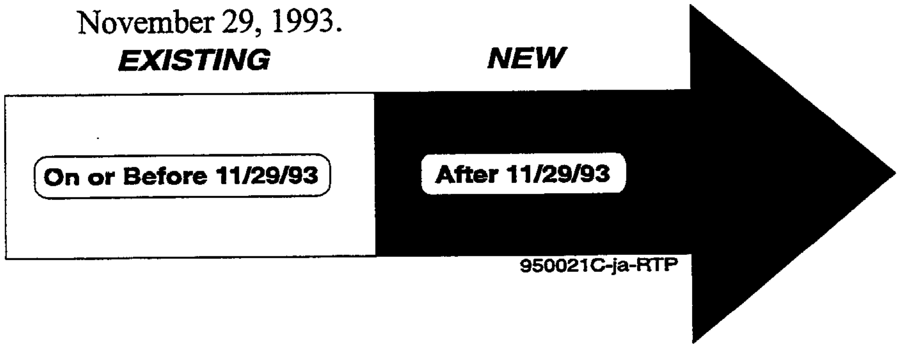
3. If your machine is a **batch vapor machine** that does not have a solvent-air interface area, you need to determine the machine's cleaning capacity (see Appendix B) to determine your overall emission limit. This is the only compliance option available for these machines.Table 2-1 presents an example worksheet that can be used to assist in keeping track of the determinations made for your machine(s). The following discussion will assist you in filling out this worksheet.

1.1 CLEANING MACHINE TYPE

The rule has different requirements for different types of machines. Cleaning machine types are classified by how parts are processed through the machine (batch vs. in-line), and by whether or not solvent vapor is created in the cleaning process (vapor vs. cold). Cleaning machines are also classified by whether the machine was installed before or after this rule was proposed (existing vs. new). New in-line machines have slightly more stringent requirements than existing in-line machines. The following text illustrates the differences between new machines and existing machines and between the different machine types.

- Existing vs. New

Existing:	Your machine is an <u>existing</u> machine if it was installed on or before November 29, 1993.[*]
New:	Your machine is a <u>new</u> machine if it was installed after November 29, 1993.



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[*] November 29, 1993 is the date the rule was proposed.

Table 2-1

Compliance Determination Worksheet
(A blank worksheet is included in Appendix C)

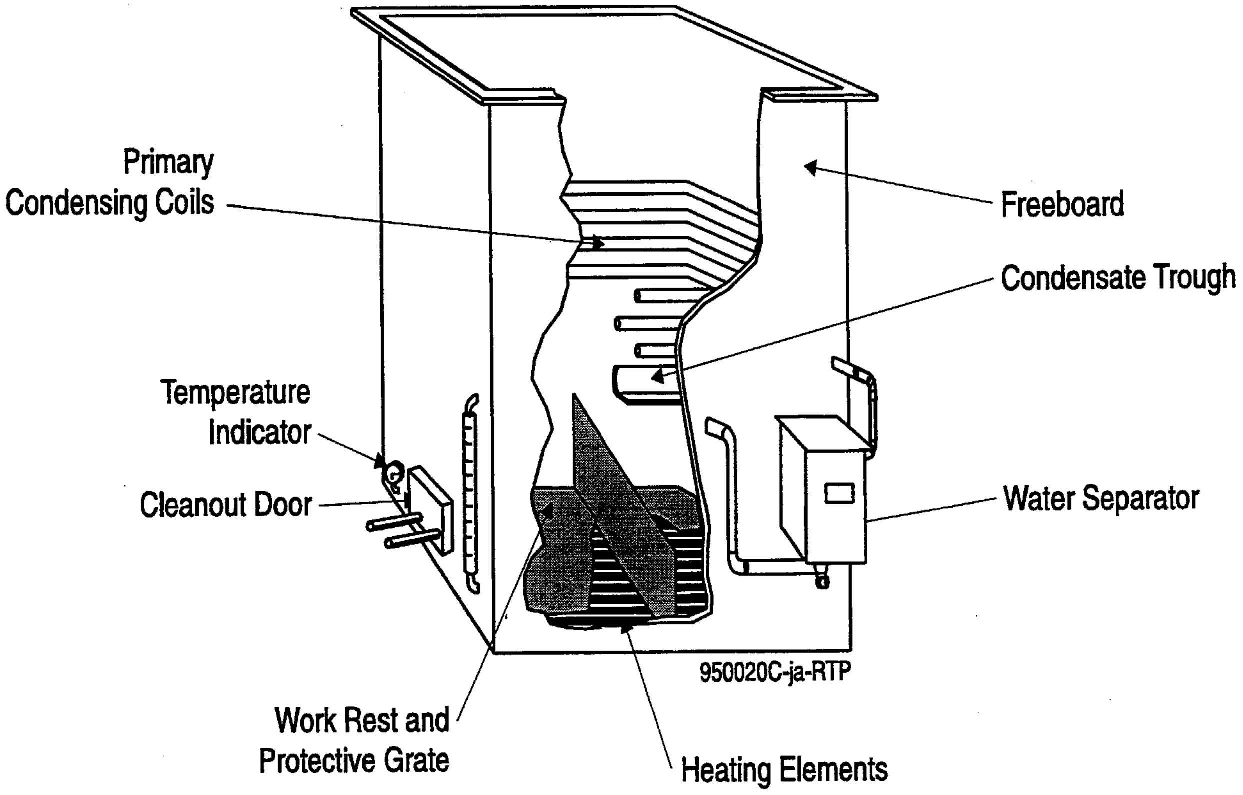
Cleaner Identification Number	Use Halogenated Solvent?[a]	New or Existing?		Pick One			Solvent Air Interface Area m^2 (ft^2)	Other[b]
		N	E	Batch Cold	Batch Vapor	In-line		
Line B-2	Yes		X			X	2.5 m (27 ft)	
Line B-3	No							
XT-46	Yes	X			X		1 m (10.76 ft)	

[a] Greater than 5 percent.

[b] Miscellaneous notes, including cleaning capacity if machine is a batch vapor cleaning machine with no solvent air interface.

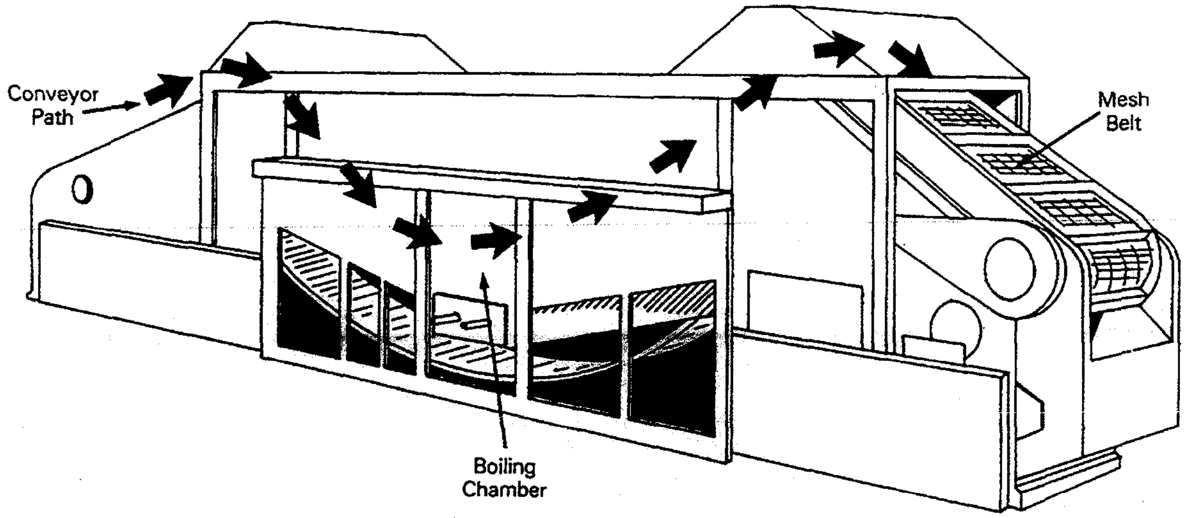
- Batch vs. In-Line

Batch: Your machine is a batch machine if new parts or baskets of parts are introduced into the machine after the previous parts or baskets of parts are done being cleaned. For example, an "open top vapor cleaner" a machine that cleans multiple batch loads simultaneously and is manually loaded, such as a "ferris wheel" machine, and a "cross-rod" machine that moves parts semi-continuously through the cleaning process are batch machines. The following figure is an example of a batch vapor machine with a cutaway to show internal features. Small buckets, pails, and beakers with solvent capacities less than 7.6 liters (2 gallons) are not considered batch cleaners.



Batch Vapor Cleaning Machine

In-Line: Your machine is an in-line machine if the movement of the conveyor that carries parts is continuous (non-stop). The following figure is an example of an in-line vapor machine.



In-Line Cleaning Machine

- Vapor vs. Cold

Vapor: Your machine is a vapor machine if it heats the solvent enough to create vapor (the batch and in-line machines illustrated here are vapor machines).

Cold: Your machine is a cold machine if it does not heat the solvent enough to create vapor. A carburetor cleaning machine is an example of a cold machine.

Example:

You own a new batch vapor machine...

NEW: If the machine was installed after November 29, 1993,

BATCH: Parts are introduced into your machine after the previous parts are done being cleaned, and

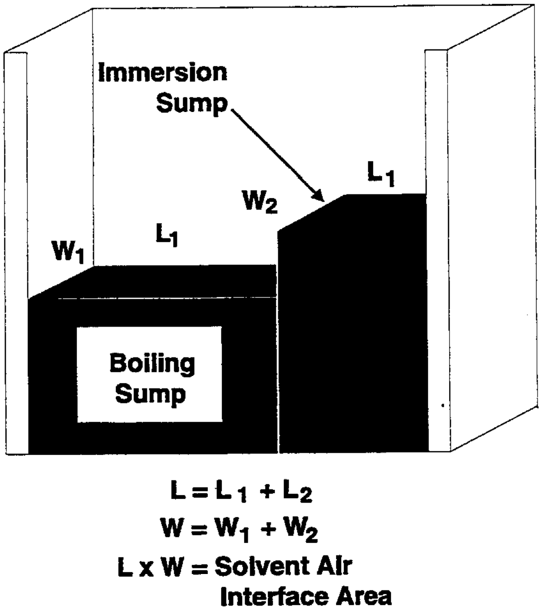
VAPOR: Vapor is created in the process (i.e., solvent is heated to create vapor).

1.2 CLEANING MACHINE SIZE

The size of your machine is important if you have a batch vapor, or in-line machine. You do not need to determine the size of your machine if you have a batch cold machine. For batch vapor machines the compliance options available depend on machine size. If you have a batch vapor or in-line machine and decide to comply with an overall emission limit (i.e., alternative standard) you will also need to know your machine size. **In this rule the size of the machine is the <u>solvent-air</u> <u>interface</u> <u>area</u>.**

The solvent-air interface for a vapor machine is the location of contact between the concentrated solvent vapor layer and the air. In a vapor machine, the vapor layer is formed when the primary cooling coils condense the rising solvent vapor. This typically occurs at the midline of the primary condenser coils. For a cold machine, it is the location of contact between the liquid solvent and the air.
The solvent-air interface area of your machine(s) can be determined in <u>any</u> of the following ways:

- Check the literature that was provided with your machine at the time of purchase to see if it includes a measurement of the solvent-air interface area for your machine;
- Ask the manufacturer of your machine(s) for the solvent-air interface area of your machine model;
- Calculate the solvent-air interface area (SA) by multiplying the width (W) (in meters [or feet]) by the length (L) (in meters [or feet]) of each sump and totalling the areas of all sumps (see Figure). Dimensions can be measured or obtained from literature.



Calculation of the Solvent-Air Interface

The solvent-air interface area for your batch and in-line machine(s) is equal to the surface area of all of the cleaning tanks of your cleaner(s). For an in-line machine, you may not be able to directly measure your machine's solvent-air interface area. In such cases, you will need to rely on the manufacturer or literature supplied by the manufacturer for the appropriate information.

If your machine does not have a solvent-air interface area, you need to determine the machine's cleaning capacity. A machine that does not have a solvent-air interface would be one that does not expose the cleaning solvent to the ambient air during or between the cleaning of parts. An example of a machine that does not have a solvent-air interface is a vacuum-to-vacuum machine. These machines are comprised of a processing chamber capable of withstanding both full vacuum and pressure. These systems operate in a closed loop, therefore, solvent is not exposed to the air outside of the machine at any time.

For a machine that does not have a solvent-air interface area, the cleaning capacity of your machine(s) will likely be available from your vendor or in the literature that was provided with your machine at the time of purchase. See Appendix B for guidance on determining your machine's cleaning capacity, if unknown, and for the solvent emission limits that are applicable to your machine(s) under the overall emission limit option.

2.0

Batch Vapor or In-Line Machine Requirements

There are three compliance options for batch vapor and in-line machines (see Figure 2-1). The first two compliance options, control combinations and an idling emission limit, require that your machine meet base design requirements. If you choose control combinations, you will need to install a list of specific controls. If you choose to maintain an idling emission standard, you are allowed to establish your own control scenario. These options both require monitoring control equipment and adherence to specified work practices. These options are described in Section 2.1.

The third compliance option is an overall emission limit (i.e., alternative standard). The overall emission limit does not specify base design, equipment, equipment monitoring, or work practice requirements. This overall emission limit standard allows the flexibility to install the equipment and implement the work practices that you choose, provided you meet the specified emission limit. This option is discussed in Section 2.2.

All three of the compliance options require some form of recordkeeping discussed in Sections 2.1.3, 2.1.5 and 2.2.3; and reporting, discussed in Section 2.3.

Remember: The compliance options for this rule are on a machine basis, rather than a facility basis. Therefore, the same compliance option does not have to be chosen for all of your machines. You can choose the compliance option that is best for each of your machines.

2.1 EQUIPMENT COMPLIANCE OPTIONS

If you choose the equipment compliance option, you must meet the base design requirements described in Section 2.1.1, follow the work practices described in Section 2.1.4, and meet additional emission control equipment requirements. You can comply with the additional emission control equipment requirements in one of two ways:

1. Use a combination of controls specifically listed in the regulation; or

2. Comply with an idling emission limit that is measured while your machine is idling.

Compliance Options		COMPLIANCE COMPONENTS				
		Base Design Requirements	Work Practices	Install A Listed Control Combination	Maintain An Established Idling Emission Rate	Maintain An Established Solvent Emission Level
Equipment Compliance Options	Control Combinations	✓	✓	✓		
	Idling Emission Limit	✓	✓		✓	
Overall Emission Limit						✓

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Batch Vapor and In-Line Machine Compliance Options

If you choose the control combination option, you must control beyond the base design requirements by meeting one of the control combinations in Section 2.1.2. If you choose the idling emission limit option, you must control beyond the base requirements by installing controls that enable your machine to meet the idling emission limits cited in Section 2.1.2.

Finally, if you choose either of the equipment compliance options, you must comply with the applicable recordkeeping requirements, described in Sections 2.1.3, and 2.1.5, and reporting requirements, discussed in Section 2.3.

2.1.1 Base Design Requirements

Each batch vapor and in-line machine complying with either of the **equipment compliance options** must have **ALL** of the following base equipment:

A Cover or a Reduced Room Draft

The machine must have a manual or working-mode cover that completely covers the machine openings. The cover must be periodically inspected to ensure that it remains free of cracks, holes, and other defects. The cover must be closed at all times except: when parts are being cleaned, when the solvent has been removed from the machine, or when maintenance or monitoring is being performed that requires the cover to not be in place. If you do not have a cover on your machine, measures must be taken to reduce the room draft (as described in Section 2.1.3).

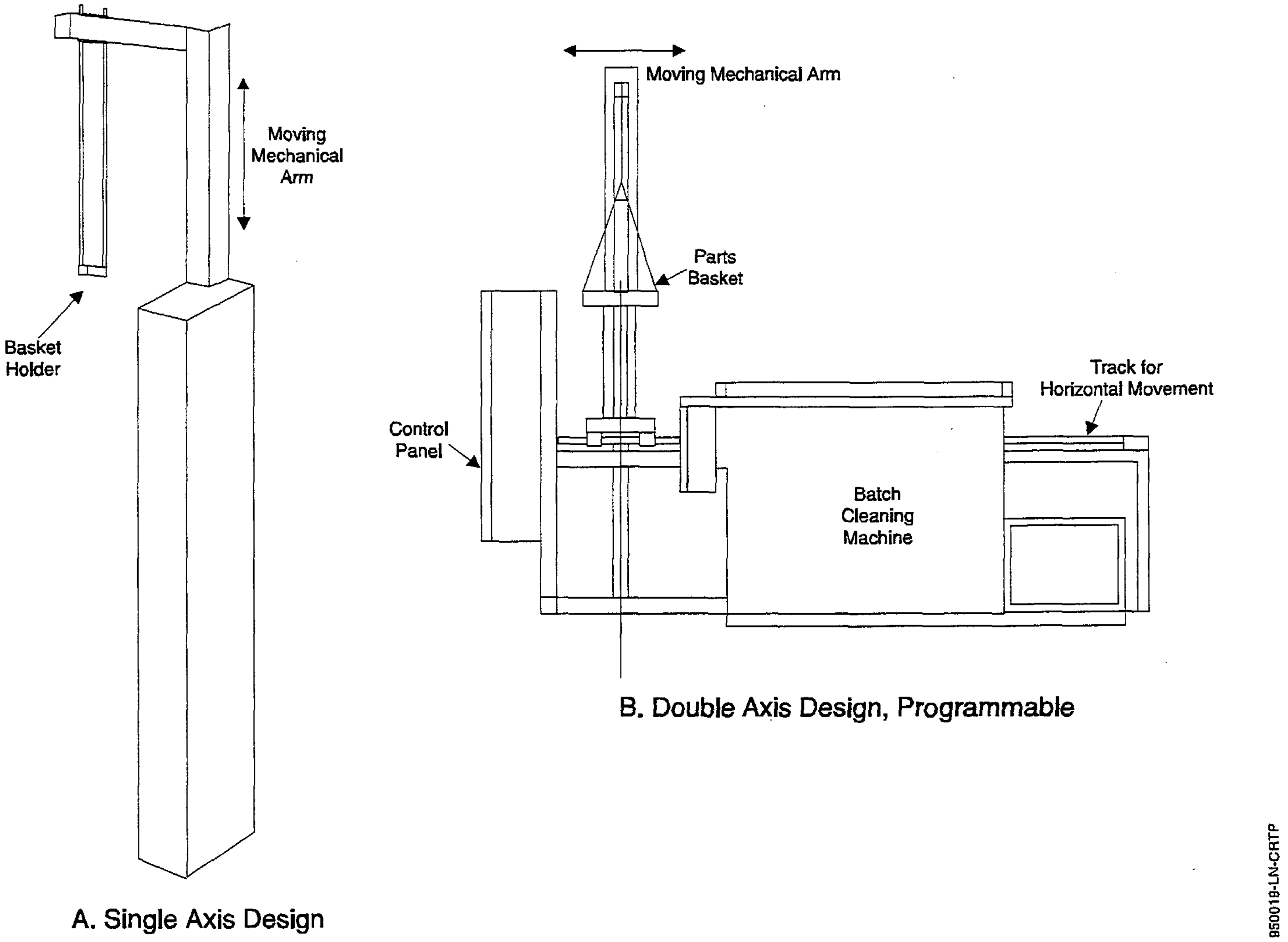
Minimum Freeboard Ratio

A freeboard ratio of 0.75 or higher is required. The freeboard ratio for your machine is the height of the freeboard divided by the smallest interior freeboard width. For example, if the height of the freeboard is 1.8 meters (5.9 feet) and the freeboard is 2 meters (6.6 feet) by 4 meters (13.2 feet) interior dimension, the freeboard ratio would be 1.8 meters/2 meters (5.9 feet/6.6 feet) or 0.9.

Automated Parts Handling

All machines must have an automated parts handling system that handles parts from initial loading to removal of cleaned parts. Examples include: motorized single-axis hoists, motorized double axis hoists, and fully programmable hoists. Parts can move at a maximum speed of 3.4 meters per minute (11 feet per minute). Manual hoists can be used if you can demonstrate that the hoist can never exceed 3.4 meters per minute (11 feet per minute).

This could be demonstrated to your regulatory authority or permitting authority by showing that the gearing of the hoist makes it physically impossible to move it fast enough to exceed 3.4 meters per minute (11 feet per minute). Although computerized or fully automated hoists or conveyors would satisfy the automated parts handling requirement, these sophisticated systems are not specifically required.



B. Double Axis Design, Programmable

A. Single Axis Design

Single and Double Axis Hoists

To determine the hoist speed, measure the time (in minutes) that it takes for the hoist to move parts or a parts basket a measured vertical distance (i.e., moving parts into or out of the machine) (in meters). The hoist's speed is then calculated by dividing the distance travelled by the amount of time it took to travel that distance. For example, if the measured time for your hoist to go from a point 1 meter (3.3 feet) above the freeboard to a point at the fill line is 45 seconds (0.75 minutes), and the distance between these points is 2 meters (6.6 feet), then the speed of your hoist is:

2 meters / 0.75 minutes = 2.7 meters per minute
6.6 feet/0.75 minutes = 8.8 feet per minute

6.6 feet/0.75 minutes = 8.8 feet per minute

Hoist monitoring must be conducted monthly. After a year of required monthly monitoring without an exceedance, the monitoring frequency can be reduced to quarterly. However, if an exceedance occurs while monitoring quarterly, you must return to a monthly monitoring schedule until another year of compliance without an exceedance is demonstrated. If you can demonstrate to your regulatory authority that the hoist cannot exceed a speed of 3.4 meters per minute (11 feet per minute), quarterly monitoring is allowed including the first year.

See Appendix C for a sample recordkeeping form that can be used for the hoist monitoring procedure.

Liquid and Vapor Level Indicators

All vapor cleaning machines must be equipped with a device that shuts off the sump heat if the sump liquid solvent level drops to the sump heater coils. The liquid level indicator is required to prevent the decomposition of the solvent. In addition, each machine must be equipped with a vapor level control device that shuts off the sump heat in a vapor cleaning machine if the vapor level rises above the height of the primary condenser. The vapor level indicator is required to prevent the overflow of solvent vapor out of the machine. There are no specific monitoring requirements for these indicators; however, they must be kept operational at all times.

Primary Condenser

All vapor cleaning machines must have a primary condenser. A primary condenser consists of a series of circumferential cooling coils on a machine through which chilled liquid or gas is circulated or recirculated to provide continuous condensation of rising solvent vapors. A primary condenser must be maintained to create a controlled vapor zone. See the Glossary for an illustration of primary condenser coils for a batch vapor cleaning machine. Cold cleaning machines are not required to have a primary condenser.

Lip Exhaust Control

Some owners and operators of solvent cleaning machines rely on lip exhausts to meet OSHA requirements. Use of a lip exhaust without any controls, while reducing worker exposure on the one hand, dramatically increases the overall solvent emissions to the air. Therefore, **if lip exhausts are used on solvent cleaning machines**, the rule requires that emissions be routed to, and controlled by, a carbon adsorption unit. Each carbon adsorption unit should be operated and maintained such that it meets the requirements described in Section 2.1.3.

2.1.2 Equipment Combinations and Idling Emission Limits

If choosing to comply with the equipment compliance options: in addition to meeting the base design requirements and work practices, you will need to ensure an additional level of control. As mentioned previously, you can do this in one of two ways:

- Pick from an established list of control combinations (Table 2-2 or 2-3); or
- Demonstrate that your own controls meet an established idling emission limit.

Control Combinations

The established list of control combinations are listed in Tables 2-2 and 2-3 for batch vapor and in-line machines, respectively. In order to comply with the equipment combination option for a given cleaning machine you must first locate that cleaning machine's type in either Table 2-2 or Table 2-3. Then you must select one of the control combinations listed for that particular cleaning machine type and ensure that all of the controls marked for that control combination are installed on that particular machine. Example scenarios follow Tables 2-2 and Table 2-3. The requirements for each control are described in Section 2.1.3.

The control combinations for batch vapor machines are separated into two groups based on solvent-air interface area. Therefore, if you have a batch vapor machine you must determine the machine's size using the procedure described in Section 1.2 of this part in order to determine the control combinations that are allowable. There are 10 control combination options available for batch vapor machines that are less than or equal to 1.21 square meters (13 square feet) in size, and 7 control combination options available for batch vapor machines that are greater than 1.21 square meters (13 square feet) in size.

The control combinations for in-line machines are separated into two groups based on their installation date. Therefore, if you have an in-line cleaning machine you need to determine the date the machine was installed. Once the installation date is determined, you can choose from the control combinations available for your machine. There are four control combinations allowable for in-line machines that were installed on or before November 29, 1993 (existing machines). There are three control combinations allowable for in-line machines that were installed after November 29, 1993 (new machines).

Table 2-2

Control Combinations for Batch Vapor Cleaning Machines

Batch Vapor Cleaning Machine Size	Option or Control Combination Number	Controls						
		Working Mode Cover	1.0 Freeboard Ratio	Super Heated Vapor	Freeboard Refrigeration	Reduced Room Draft	Carbon Adsorber	Dwell
Solvent-air Interface Area <u>Less than</u> or equal to 1.21 square meters (13 square feet)	1	√	√	√				
	2			√	√			
	3	√			√			
	4		√	√		√		
	5				√	√		
	6		√		√			
	7				√			√
	8		√			√		√
	9				√		√	
	10		√	√			√	
Solvent-air Interface Area <u>Greater than</u> 1.21 square meters (13 square feet)	1		√	√	√			
	2				√	√		√
	3	√		√	√			
	4		√	√		√		
	5			√	√	√		
	6		√		√	√		
	7			√	√		√	

Example:

If your batch vapor cleaning machine is 1 square meter (10.76 square feet) in size, one of the 10 control combinations in the first half of Table 2-2 can be chosen. If your machine already has a freeboard refrigeration device and a 0.75 freeboard ratio, you might choose to comply with control option #6 by increasing the freeboard ratio of the machine to 1.0. Alternatively, you might choose to comply with control option #7 by holding parts in the freeboard area longer (dwell).

Table 2-3

Control Combinations for In-Line Cleaning Machines

In-Line Cleaning Machine Type	Option or Control Combination Number	Controls				
		1.0 Freeboard Ratio	Super Heated Vapor	Freeboard Refrigeration	Carbon Adsorber	Dwell
Existing Machines	1	√	√			
	2	√		√		
	3			√		√
	4				√	√
New Machines	1		√	√		
	2			√	√	
	3		√		√	

Example:

If your in-line machine was installed in December of 1993, one of the three control combinations in the second half of Table 2-3 can be chosen. If your machine already has a carbon adsorber exhaust system you could choose to comply with control option #2 by adding a freeboard refrigeration device.

Equivalency: The methods of control in Tables 2-2 and 2-3 are not the only controls that you can use when complying with the rule under the control combination option. Other controls can be used if you can demonstrate that they can achieve the same overall emission reduction as the control combinations presented in the tables. For more information on how to demonstrate this equivalency, contact your state or local air pollution control agency or the EPA Regional Office where your state or territory resides (see Appendix J for contact numbers). In general, however, it may be easier for you to simply comply with the idling emission limit discussed below.

Idling Emission Limits

As an alternative to the listed control combinations, you can choose to comply with the idling emission limit option. To do this, you are required to meet an emission limit that is measured while the machine is idling (i.e., turned on, but not actively cleaning parts). For batch vapor machines this idling emission rate is 0.22 kg per hour per square meter (0.045 pounds per hour per square foot) of solvent-air interface area. For in-line cleaning machines this idling emission rate is 0.10 kg per hour per square meter (0.021 pounds per hour per square foot) of solvent-air interface area.

It is expected that manufacturers will provide the idling emission rate for the machines they manufacture as a service to their customers. If this service is not provided, you must use Test Method 307 to determine the idling emission rate for your machine. Idling emissions are to be measured under idling conditions (e.g., cover on) (see Appendix H for the regulation and Test Method 307). A blank example calculation form is included in Appendix D for your convenience. This form is <u>not</u> required; any recordkeeping format incorporating the required documentation would be acceptable.

2.1.3 Individual Control Requirements

For each of the controls that are used to comply with the control combination or idling emission limit option, there are specific design, monitoring, and recordkeeping requirements. These requirements are presented in Table 2-4 and are further explained in the following text. The design requirements are necessary to define the controls and ensure that each control is capable of fulfilling its intended purpose. The monitoring requirements, which involve periodic checks of key equipment parameters, are necessary to make sure the equipment is working properly. Recordkeeping is necessary to document the results of installation, monitoring, and determination results. Additional information regarding the monitoring and recordkeeping requirements for each control device is presented below. If you use a control not included in Table 2-4 to comply with the idling emission limit, you must submit design, monitoring and recordkeeping requirements to your regulatory agency for approval. This information must be submitted with your idling emission standard test report.

Carbon Adsorber (In Conjunction With a Lip Exhaust)

The rule requires that a carbon adsorber achieve an outlet concentration of no more than 100 ppm of the covered solvents. Compliance with this requirement must be determined by measuring and recording the concentration of the halogenated solvents in the exhaust of the carbon adsorber with a colorimetric detector tube. This test needs to be done while the machine is in the working mode (i.e., actively cleaning parts).

The colorimetric detector tube must be designed to measure a concentration of 100 parts per million by volume of solvent in air to an accuracy of within 25 parts per million by volume. You must follow the manufacturer's particular instructions for the use of their detector. The samples must be taken at a point where the air flow is unobstructed. According to the rule, the sampling port must be within the exhaust outlet of the carbon adsorber that is easily accessible and located at least 8 stack or duct diameters downstream from any flow disturbance such as a bend, expansion, contraction, or outlet; downstream from no other inlet; and 2 stack or duct diameters upstream from any flow disturbance such as a bend, expansion, contraction, inlet or outlet. If the concentration exceeds 100 ppm, adjust the desorption schedule or replace the canister so that the exhaust concentration of halogenated solvent is brought below 100 ppm. If concentrations exceed 100 ppm after 15 days, you need to submit an exceedance report (see Section 2.3.4 of this part).

Appendix C contains an example recordkeeping form for the documentation of carbon adsorber exhaust solvent concentrations.

Table 2-4 (Continued)

Control Device	Compliance Requirements	Recordkeeping Requirements[a]	Violation	
			Immediate[b]	If Not Corrected Within 15 Days[c]
Freeboard Ratio of 1.0	• Ensure and obtain certification from the manufacturer that the freeboard height is greater than or equal to the width of the interior freeboard.	• The freeboard ratio (height of freeboard divided by the smallest interior freeboard width). • Any modifications to the freeboard ratio.	• If the freeboard ratio is less than 1.0.	
Freeboard Refrigeration Device	• Air in freeboard must be no greater than 30 percent of the solvent boiling point (in °F). • Measure air blanket temperature above the vapor zone (at center) **weekly** while machine is idling.	• Results of temperature measurement.		• If temperature requirement is exceeded.
Idling-Mode Cover	• Cover must be closed. • Inspect cover **monthly**.	• Results of inspection.	• place when idling.	• If the cover has cracks, holes, or other defects.

[a] All records are to be retained for 5 years unless otherwise noted.
[b] Immediate violation if parameter is exceeded.
[c] violation if not corrected within 15 days.
[d] Retain for lifetime of machine.

Table 2-4

Control Combination Device Requirements

Control Device	Compliance Requirements	Recordkeeping Requirements[a]	Violation	
			Immediate[b]	If Not Corrected Within 15 Days[c]
Carbon Adsorber (and Lip Exhaust)	• The exhaust solvent concentration cannot exceed 100 ppm. • The carbon bed cannot be by-passed during desorption. • The lip exhaust must be located above the cover. • Measure the exhaust concentration of the covered solvents **weekly**.	• The exhaust concentration (in ppm) of the covered solvents.		• If the exhaust concentration of the covered solvent exceeds 100 ppm.
Dwell	• for parts to be cleaned. • Ensure that parts are held in the freeboard area above the vapor zone for the determined dwell time. • Measure the actual dwell time of parts **monthly**.	• Determined dwell time (in seconds) and time measurement calculations.[d] • Measured dwell time (in seconds).	• If a proper dwell is not determined and maintained.	

[a] All records are to be retained for 5 years unless otherwise noted.
[b] Immediate violation if parameter is exceeded.

Table 2-4 (Continued)

Control Device	Compliance Requirements	Recordkeeping Requirements[a]	Violation	
			Immediate[b]	If Not Corrected Within 15 days[c]
Reduced Room Draft	• Windspeed in room or within enclosure must be less than or equal to 15.2 meters per minute (50 feet per minute).			
	• If controlling room conditions: - Establish room conditions during initial test and quarterly thereafter (must be redone **immediately** if conditions change). - Monitor room conditions **weekly**.	• Windspeed measurement • Room conditions	• Not establishing room parameters under which the reduced room draft is achieved. • Room conditions not being maintained as described in compliance report.	• If windspeed exceeds 15.2 meters per minute (50 feet per minute).
	• If using an enclosure: - Measure windspeed in enclosure **initially** and **monthly**, thereafter (must be remeasured **immediately** if the enclosure is modified). - Inspect condition of enclosure **monthly**.	• Windspeed measurement • Enclosure inspection results.		• If windspeed exceeds 15.2 meters per minute (50 feet per minute).

[a] All records are to be retained for 5 years unless otherwise noted.
[b] Immediate violation if parameter is exceeded.
[c] violation if not corrected within 15 days.
[d] Retain for lifetime of machine.

Table 2-4 (Continued)

Control Device	**Compliance Requirements**	**Recordkeeping Requirements**[a]	**Violation**	
			Immediate[b]	**If not corrected within 15 days**[c]
Super Heated Vapor System	• Solvent vapor at the center of the superheated vapor zone must be heated to at least 10°F above the solvent's boiling point. • Ensure that parts stay in the superheated vapor zone for the manufacturer's minimum recommended dwell time. • Measure the temperature at the center of the superheated vapor zone **weekly** while the machine is idling.	• The temperature measurement of the superheated vapor.	• If the proper superheated vapor zone is not determined and maintained.	• If the temperature of the solvent vapor at the center of the superheated vapor zone is not at least 10°F above the solvent boiling point.
Working-Mode Cover[e]	• Cover must be closed over entire cleaning machine opening at all times except during parts entry and removal. • Inspect cover **monthly** to ensure that it opens and closes properly and is free of cracks, holes, and other defects.	• Results of inspection.	• If cover is not closed at all times, except during parts entry and removal.	• If the cover has cracks, holes, or other defects.

[a] All records are to be retained for 5 years unless otherwise noted.
[b] Immediate violation if parameter is exceeded.
[c] Violation if not corrected within 15 days.
[d] Retain for lifetime of machine.
[e] A working-mode cover would also meet the idling-mode cover requirements.

Cover (Idling-Mode and Working-Mode)

Solvent cleaning machines typically have a cover. Covers are classified as working-mode covers or idling-mode covers (depending on when the covers can be closed).

An idling-mode cover is a cover that is closed at all times except when the machine is actually cleaning parts. An idling-mode cover should also be closed between loads, if possible. A sliding cover is an example of an idling-mode cover.

A working-mode cover is a cover that can be closed at all times, including when parts are being cleaned. The only time a working-mode cover opens is when parts are entering or exiting the machine. An example of a working-mode cover is a bi-parting cover. However, any cover that can be closed during cleaning qualifies as a working-mode cover. This includes a cover on a machine with a hoist system designed to detach the parts from the hoist during cleaning; this allows the cover to be closed while the parts are being cleaned. Use of a working-mode cover would also satisfy the idling cover requirements in the rule.

If the compliance option you choose includes the use of a cover, every month you must, (1) inspect whether the cover is opening and closing properly during the proper operating modes, (2) whether the cover completely covers the cleaning machine(s) openings when closed, and (3) whether the cover is free of cracks, holes, or other defects. See Appendix C for an example recordkeeping form that can be used to document your monthly cover inspection results.

Dwell

Dwell time is the period of time that parts are held in the machine freeboard area above the vapor zone after they are cleaned. A dwell time is used to ensure that liquid solvent on and in the part either vaporizes within the machine confines or drains back into the machine rather than into the work area. It also allows any vapor trapped within parts to flow back into the machine. There are two alternatives for implementing the dwell:

1. You can determine and use the appropriate dwell time for each of the parts or parts baskets that you clean; <u>or</u>
2. You can determine and use the maximum dwell time using the most complex part type or parts basket.

The method for determining the proper dwell time is based on the primary cleaning time; the primary cleaning time is the time required for a room temperature part to stop dripping when placed in the vapor zone (i.e., amount of time it takes to reach the vapor zone temperature). Once the part stops dripping, cleaning stops unless other cleaning actions (e.g., dipping the part in the liquid solvent) occur.

The dwell time is determined as follows:

1. Measure (with a clock or stopwatch) the amount of time it takes for the parts or parts baskets to cease dripping once placed in the vapor zone. This is the primary cleaning time. (Remember, parts must be at room temperature before placing them in the vapor zone.)
2. The dwell time must be no less than 35 percent of the primary cleaning time determined above.

Example:

If your part or parts basket stops dripping after 2 minutes (120 seconds) in the vapor zone, then the proper dwell time for that part or parts basket would be equal to:

120 seconds * 0.35 = 42 seconds

To monitor the dwell time, you must measure and record the actual dwell time monthly. In addition, records of tests required to determine the appropriate dwell time must be kept. An example recordkeeping form that can be used to document the dwell time for a part or parts basket is provided in Appendix C.

Freeboard Refrigeration Device (FRD)

A FRD chills the air immediately above the vapor zone forming a cool air blanket that slows the diffusion of solvent out of the machine. The rule requires that a FRD have enough cooling capacity to cool the air in the freeboard area of the machine to a temperature that is no greater than 30 percent of the boiling point (in degrees Fahrenheit) of the solvent being used. An example calculation for determining the maximum required FRD temperature for a solvent with a boiling point of 100 degrees Fahrenheit follows:

100 degrees Fahrenheit x 0.3 = 30 degrees Fahrenheit
(maximum FRD temperature)

Therefore, if you are using a solvent with a boiling point of 100 degrees Fahrenheit your FRD must cool the air in the freeboard area of the machine to at least 30 degrees Fahrenheit. Table 2-5 lists the temperature that a FRD must achieve for each of the solvents covered by the rule.

Table 2-5

Freeboard Refrigeration Device Temperature Requirements

Solvent	Boiling Point °F	Maximum Allowed Air Blanket Temperature	
		°F	°C
Methylene Chloride	104	31	0
Trichloroethylene	189	57	14
1,1,1-Trichloroethane	165	50	10
Chloroform	143	43	6
Carbon Tetrachloride	168	50	10
Perchlorothylene	250	75	24

°F = degree Fahrenheit
°C = degree Celsius

The temperature measurement must be made weekly at the center of the air blanket above the vapor zone during the idling mode. This measurement can be accomplished by attaching a thermometer or a thermocouple to the parts basket or hoist hook and lowering it into the machine so that it is in the center of the air blanket above the vapor zone. This is done when the machine is turned on but not processing parts.

A blank recordkeeping form that can be used to document the maximum allowed freeboard air temperature and the weekly measurement of this temperature can be found in Appendix C.

Reduced Room Draft (RRD)

When using the RRD control technique, roomdrafts must not exceed 15.2 meters/minute (50 feet/minute). A variety of techniques can be used to reduce room drafts. Methods to reduce room drafts include, but are not limited to:

- Redirecting air vents and/or fans so that they do not blow into, across, or through the machine,
- Moving the machine to an area with less cross-ventilation, permanently closing doors or windows, or
- Enclosing the machine.

Any method can be used as long as the requirements for RRD are met and maintained.

Windspeed measurements are to be taken by doing the following:

Step 1: Determine the direction of the wind by rotating a velometer (or similar windspeed measuring device) within six inches above the top of the freeboard area of your machine until the maximum speed is located.

Step 2: Orient the velometer in the direction of the wind at each of the four corners of your machine and record the reading for each corner.

Step 3: Total the values obtained at each corner and divide the total by four. The result is the average windspeed. Record the average windspeed.

To ensure that the RRD requirement is met continuously, the rule requires that the room conditions established during the test be maintained. See Appendix C for an example recordkeeping form for the RRD measurements.

> *Example:*
>
> Your measurements indicate that the windspeed near your solvent cleaning machine is 30 meters per minute (100 feet per minute). This is twice the allowable reduced room draft windspeed. Looking at the room parameters you notice that most of the wind is coming from an air vent. You redirect the air vent, close the windows in the room, and remeasure the windspeed. This time the windspeed is 14 meters per minute (45 feet per minute), which is below the reduced room draft windspeed of 15.2 meters/minute (50 feet/minute). As part of establishing your RRD you now must write down the room conditions that allowed you to achieve the RRD. For instance, the vent must be directed away from the cleaning machine and the windows must be closed. If the door was opened during the test, the door can be open or closed. Each month you would make sure that these parameters stay the same.

If a full or partial enclosure is used to achieve the reduced room draft for your machine(s), you need to conduct an initial windspeed monitoring test and, thereafter, measure and record the wind speed within the enclosure monthly. The wind speed within the enclosure can be measured by slowly rotating a velometer (or similar wind measuring device) inside the entrance to the enclosure until the maximum windspeed is located. Along with your windspeed measurements, you also need to monitor and record the maintenance of the enclosure monthly.

Super-Heated Vapor (SHV) System

Super-heated vapor systems create super-heated solvent vapor within the vapor zone. Parts are held within the SHV. The SHV heats the parts and evaporates liquid solvent on the parts before they are withdrawn from the cleaning machine. The rule requires that a SHV system heat solvent vapor at the center of the SHV zone to at least 10 degrees Fahrenheit above the solvents' boiling point. Table 2-6 lists the minimum temperature that a SHV system must achieve in the super-heated vapor zone for the solvents covered by the rule.

If you use a SHV system to comply with the rule, you need to follow the manufacturer's specifications for determining the minimum proper dwell time within the SHV and make sure parts stay within the SHV for at least that long. The temperature at the center of the super-heated vapor zone can be measured by attaching a thermometer or thermocouple to the hoist hook or parts basket and then introducing it into the center of the super-heated vapor zone of the machine. Appendix C contains a blank recordkeeping form that can be used to document the measured vapor zone temperature.

Table 2-6

Super-Heated Vapor Temperature Requirements

Solvent	Boiling point		Minimum Allowed SHV Temperature	
	°F	°C	°F	°C
Methylene Chloride	104	40	114	46
Trichloroethylene	189	87	199	93
1,1,1-Trichloroethane	165	74	175	79
Chloroform	143	62	153	67
Carbon Tetrachloride	168	76	178	81
Perchloroethylene	250	121	260	127

°F = degrees Fahrenheit
°C = degrees Celsius

2.1.4 Work Practices

Each operator of a machine complying with the equipment compliance option must implement the following work practices. A one page summary of these work practices that can be used as a reminder poster in the work place is included in Appendix E for your convenience.

Maintain Equipment as Recommended by the Manufacturer

To make sure that the machine and its associated controls are working properly you are required to maintain the equipment as recommended by the manufacturers of the equipment. Alternative maintenance practices can be used if they have been demonstrated to the approved permitting authority's satisfaction to achieve the same or better results as those recommended by the manufacturer. For additional information on how to demonstrate equivalency contact your State or local air pollution control agency.

The rule requires that you maintain paper or electronic records (i.e., computer disk) of the following for the lifetime of the machine:

- **Owner's manuals** for each machine and piece of control equipment. If unavailable, written maintenance and operating procedures can be substituted.
- Records documenting the **installation date** of your machine(s). If this date is not known, you can maintain a letter certifying that the machine(s) were installed prior to, or on, November 29, 1993, or after November 29, 1993. November 29, 1993, is the date that this rule was proposed. This date is important because any machine installed on or before this date is considered an "existing source" and any machine installed after this date is considered a "new source." In this rule, some existing and new sources have slightly different compliance requirements.

The rule requires that you maintain a record of your solvent consumption estimates for each of your machines in paper or electronic form (i.e., computer disk) for 5 years, regardless of the compliance option you choose. Appendix C contains an example recordkeeping form that can be used to document your solvent consumption estimates. Specific recordkeeping requirements based on the control compliance option chosen are presented in Sections 2.1.3 and 2.1.5.

2.2 OVERALL EMISSION LIMIT

Rather than complying with one of the equipment compliance options presented in Section 2.1, you could elect to comply with an overall emission limit (i.e., alternative standard). This option allows you the flexibility to establish your own emission reduction strategy provided you comply with the overall emission limit. Applicable overall emission limits are based on your cleaning machine type and size. If you comply with the limit specified for your machine, you do not have to follow any additional equipment monitoring or work practice requirements. In addition, operators of machines complying with this option are not subject to the solvent cleaning procedures test presented in Section 2.1.4.

This option is generally easiest to comply with when a machine is either already well-controlled or infrequently used. During the 3 years before compliance, you may want to measure the solvent emissions from your "existing " machines to see if this option is feasible for your situation.

2.2.1 Determining Your Overall Emission Limit

To determine the 3-month average monthly emission limit for your machine(s), you need to multiply the solvent-air interface area ("size") of the machine by the applicable limit specified in Table 2-7 (see example).

If your machine does not have a solvent-air interface area, your emission limit is based on your machine's cleaning capacity. An emission limit based on a machine's cleaning capacity is not a compliance option for a machine with a solvent-air interface area. See Appendix B for applicable emission limits based on a machine's cleaning capacity. Records of the cleaning capacity determination for each of your machines without a solvent-air interface are to be maintained on site in paper or electronic form (i.e., computer disk) for the lifetime of the machine. Appendix C contains an example recordkeeping form that can be used to document this determination.

Table 2-7

Overall Emission Limit

Machine Type	3-Month Average Monthly Emission Limit (kg/m^2 x month)[a]	3-Month Average Monthly Emission Limit (lbs/ft^2 x month)[b]
Batch vapor	150	30.7
Existing in-line	153	31.4
New in-line	99	20

[a] m^2 = The total surface area of all cleaning tanks for a particular machine (i.e., solvent-air interface area).
[b] ft^2 = The total surface area of all cleaning tanks for a particular machine (i.e., solvent-air interface area).

Example:

If you own or operate a batch vapor cleaning machine with a solvent-air interface area of $10 m^2$ ($108 ft^2$) the monthly emission limit is calculated as follows:

$$10\ m^2 \times 150\ kg/m^2 \times month = 1{,}500\ kg/month$$

or

$$108\ ft^2 \times 30.7\ lb/ft^2 \times month = 3{,}316\ lb/month$$

Example:

If you own or operate a vacuum to vacuum cleaning machine with no measurable solvent-air interface, you must use the procedure in Appendix B to determine the cleaning capacity. If the cleaning capacity has been measured to be $5.5\ m^3$, you must find the corresponding emission limit in Table B-1. Which in this case is 918 kg/month (2,024 lb/month).

2.2.2 Calculating Your 3-Month Rolling Average Emissions

Compliance with the overall emission limit option (i.e., alternative standard) is demonstrated by determining the 3-month rolling average monthly emissions for each cleaning machine for which you have chosen this compliance option. The steps to calculate this value for each machine are outlined below.

Step 1: On the first operating day of each month, gather the following information for each machine for the preceding month.

SA - The amount of halogenated solvent (i.e., C, CT, MC, PCE, TCA, TCE) added (kilograms [or pounds] of solvent added) to the machine that month (including any solvent added to bring the solvent level up to the fill line).

- The solvent level should be returned to the same level at the beginning of each month before calculations are made. This is typically done by filling the tank to a marked solvent fill line.
- The solvent in the machine should be clean. The rule specifically states that the solvent does not have to be new solvent. However, all metal and dirt should be removed from the machine. This will ensure that the solvent emissions calculated for the machine are accurate.

LSR - The amount of halogenated solvent removed (kilograms [or pounds] of liquid solvent removed) from the machine that month.

- The amount of solvent removed means the amount of solvent intentionally removed from your machine during the month. It does not mean that you need to remove (or drain) the solvent from your machine every month.

SSR - The amount of halogenated solvent removed (kilograms [or pounds] of solvent removed) from the machine in solid waste.

- This information can be obtained by using the EPA test method 25D-Determination of the Volatile Organic Concentration of Waste Samples (56 FR 33544). This test method requires the use of a flame ionization detector (FID) or an electrolytic conductivity detector (ELCD). The use of this equipment should not be attempted by someone unfamiliar with their operation.
- Alternatively, this information can be obtained from engineering calculations.

AREA - The solvent-air interface area of the machine, in square meters (or square feet). A description of how to determine the solvent-air interface is provided in Section 1.2 of this part.

Subtract the sum of LSR and SSR from SA. Then, divide this by AREA. The result is E_1, the monthly emissions (kilograms of solvent emitted per square meter of solvent-air interface area [or pounds of solvent emitted per square foot of solvent-air interface area]) for that given month.

$$\frac{SA - (LSR + SSR)}{AREA} = E_1$$

Step 2: Add the solvent emissions (E_1) determined in Step 1 to the emissions calculated for the 2 previous months (E_2 and E_3) to obtain E_{SUM}, the total solvent emissions for the last 3 months (kilograms per square meter [or pounds per square foot])

$$E_1 + E_2 = E_3 = E_{SUM}$$

- E_1 - Monthly emissions (kilograms per square meter [or pounds per square foot]) for the current month.
- E_2 - Monthly emissions (kilograms per square meter [or pounds per square foot]) from the previous month.
- E_3 - Monthly emissions (kilograms per square meter [or pounds per square foot]) from two months prior.
- E_{SUM} - Total solvent emissions for the last 3 months (kilograms per square meter [pound per square foot]).

Step 3: Divide E_{SUM} by three. The result is EA, the 3-month rolling average monthly emissions (kilograms of solvent emissions per square meter of solvent-air interface area [pound of solvent emissions per square foot of solvent-air interface area]) for that month for each machine.

$$\frac{E_{SUM}}{3} = E_A$$

- E_A = The 3-month rolling average monthly emissions (kilograms of solvent emissions per square meter of solvent-air interface area [or pounds of solvent emissions per square foot of solvent-air interface area]).

2.2.3 Overall Emission Limit Recordkeeping

The overall solvent emission limit (i.e., alternative standard) option has no associated monitoring and has less recordkeeping requirements than the equipment options (i.e., equipment combinations and idling emission limit options). If you choose to comply with the overall solvent emission limit option you must maintain the following records on site in paper or electronic form (i.e., computer disk) for 5 years:

- Records of the dates and amounts of solvent added to the machine.
- The amount of solvent in the wastes removed from the machine.
- Calculation sheets showing how the monthly emissions and the 3-month rolling average monthly emissions were determined (See Appendix C for example calculation recordkeeping forms).

2.3 REPORTING REQUIREMENTS

Regardless of the selected compliance option, you are required to submit periodic reports. The reports are necessary to inform your regulatory agency that this rule applies to you and that you are complying with the rule. Information for all machines subject to the rule can be included in a single report. The types of reports specifically required by this rule are:

- An initial notification report;
- Initial statement of compliance report;
- Annual compliance reports;
- An exceedance report (required only when an exceedance occurs); and
- An equivalency determination report (required only if you want to request a procedure or equipment equivalency).

Since you are subject to this rule, you also have General Provision reporting requirements. See the final rule in Appendix I for a table of General Provision requirements that apply to this rule. It is beyond the scope of this document to provide example forms for these requirements.

Each owner and operator of cleaning machines covered by this rule must submit the appropriate reports as described in this section. Some of the information requested in the reports (e.g., name, address, etc.) are facility specific, but **most of the information requested in the reports is machine specific**. This is because compliance with the rule is determined on a per machine basis, not on a per facility basis. Therefore, as indicated later in this section, **you may need to provide different information in your reports for machines complying with different options**. Differences also exist between the reports required for new and existing cleaning machines. These differences generally do not affect the content of the report, but do affect the **timing** of the report. The following example illustrates the different requirements for a new and existing machine required to complete an initial notification and initial compliance report.

Example:

For example, lets say you have two batch vapor cleaning machines, A and B. Cleaning machine A is an existing machine for which you have chosen the equipment combination compliance option. Cleaning machine B is a new machine (constructed on January 26, 1995, startup beginning on February 15, 1995) for which you have chosen the overall emission limit compliance option.

Initial Notification Report

For machine A, the initial notification report is due by August 29, 1995, for machine B, it is due by January 26, 1995. The type of information that you provide in the initial notification reports will be identical for each machine, except that for machine A, you have to certify that it is an existing machine, and for machine B, you must provide information on the date of construction and startup.

Initial Statement of Compliance

For machine A, the initial statement of compliance report is due by December 2, 1997, for machine B it is due by July 15, 1995. The content of the two reports differ due to the different compliance options chosen. The report for machine A will contain information on the controls used and the monitoring parameters to be measured. The report for machine B will contain information on the solvent air-interface area and the 3-month rolling average monthly emission calculation.

example reporting forms are included in Appendix F for your convenience. These forms are not required; any report format incorporating the required information would be acceptable.

2.3.1 Initial Notification Report

The initial notification report is used to notify the appropriate regulatory authority that the rule applies to you. It also provides some preliminary facility and machine information. The schedule for submitting the report is dependent on the type and status (i.e., new versus existing) of the machine.

- A report for existing machines is due by August 29, 1995.
- A report for new machines, where construction or reconstruction and initial startup had not begun before December 2, 1994, is due as soon as possible before startup, but no later than January 31, 1995.

- A report for new machines, where construction or reconstruction began after December 2, 1994, is due as soon as possible before starting construction or reconstruction of the machine.

The content of the initial notification report is slightly different for existing and new batch vapor and in-line cleaning machines as indicated below. The initial notification report should include the following information:

- Your name and address;
- The address (i.e., physical location) of your solvent cleaning machine(s);
- A description of your solvent cleaning machine(s), including type (i.e., batch vapor, in-line vapor, in-line cold), solvent-air interface area, and existing controls;
- The anticipated compliance approach for each of your machine(s) (i.e., control combinations, idling emission limit, or the overall emission limit),
- An estimate of annual halogenated HAP (i.e., C, CT, MC, PCE, TCA, TCE) solvent consumption for each machine;
- Identification of the relevant standard;
- Whether you are an area or major source (see Glossary for a definition of major and area source); and
- If the report is for an existing machine, installation date or certification letter indicating that your machine(s) and its control devices were in-place before November 29, 1993.
- If the report is for a new machine, you need to submit the following, if applicable,
    - A notification of intention to construct,
    - The expected date of construction or reconstruction commencement,
    - A notification of the date when construction or reconstruction commenced,
    - The expected completion date of the construction or reconstruction, and
    - The anticipated date of initial startup of machine.

Example initial notification report forms are included in Appendix F for your convenience.

2.3.2 Initial Statement of Compliance Report

The initial statement of compliance report is used to demonstrate to the appropriate regulatory authority that your machines are in compliance with the rule. It includes information on the control option chosen and the necessary demonstration measurements.

- An existing machine must to be in compliance with the rule by December 2, 1997, and an initial statement of compliance report is due no later than May 1, 1998.
- A new machine must be in compliance with the rule at startup or December 2, 1994, whichever is later. The initial statement of compliance report for a new machine is due no later that 150 days after startup or May 1, 1995, whichever is later.

The content of the initial statement of compliance report differs depending on the compliance option you choose.

If you choose to comply with the control combination or idling emission limit equipment standard, the initial statement of compliance report should include the following information for each machine:

- Your name and address;
- The address (i.e., physical location) of your machine(s);
- A list of the control equipment used on your machine to comply with the rule;
- For each piece of control equipment on your machine that is required to be monitored, a list of parameters that are to be monitored and the values of these parameters measured on or during the first month after the compliance date;
- If you use reduced room draft as a control option you need to report the conditions that must be maintained to comply with the windspeed requirement (e.g., enclosure, closed doors, closed windows);
- If you choose to comply with the idling emission limit you need to submit an idling emission limit test report for tests of idling emissions (this test report can come from the vendor or manufacturer of your machine [Section 2.1.2 of this part presents a discussion on the idling emission limit option]); and
- If you use a carbon adsorber as a control option you need to submit a report of the weekly measurement of the halogenated HAP solvent concentration in the carbon adsorber exhaust for your machine.

An initial statement of compliance report form is included in Appendix F for your convenience.

If you choose to comply with the alternative standard (i.e., overall emission limit), the initial statement of compliance report should include the following information for each machine:

- Your name and address;
- The address (i.e., physical location) of your machine(s);
- The solvent-air interface area for each machine, or for a machine without a solvent-air interface area, a description of the results and method used to determine the cleaning capacity of your machine(s); and
- The results of the first three-month rolling average monthly emissions calculation.

An initial statement of compliance notification report form is included in Appendix F for your convenience.

2.3.3 Annual Compliance Report

Everyone complying with the rule must submit an annual report. This report is due before February 1 of the year following the year your report covers. If you chose to comply with the control combination or idling emission limit options this report must contain the following information:

- A statement, signed by you (the owner or operator) or someone you designate, stating that, "All operators of solvent cleaning machines have received training on the proper operation of solvent cleaning machines and their control devices sufficient to pass the test required."
- A solvent consumption estimate for the reporting period for each of your machines (i.e., over the course of the reported year).

If you chose to comply with the alternative standard (i.e., overall emission limit) option, this report must to contain the following information:

- The size (solvent-air interface area or cleaning capacity) and type (e.g., batch vapor cleaning machine) of each machine.
- The average monthly solvent consumption for each machine.
- The three-month monthly rolling average solvent emission estimates calculated each month for each machine.

An example annual report form is included in Appendix F for your convenience.

2.3.4 Exceedance Report

Exceedance reports are required for all machines. An exceedance report states whether any exceedances in monitored parameters have occurred and what actions were taken to correct any exceedances. An exceedance report is required every 6 months if there is not an exceedance, and every 3 months if there is an exceedance. If an exceedance did not occur the report would consist of a statement certifying that there were no exceedances. Your regulatory agency may decide that you need to submit this report more frequently.

The frequency of the exceedance report increases to quarterly after an exceedance occurs. The first quarterly report must be submitted in the quarter during which the exceedance occurred. The quarterly exceedance report should contain the following information:

- If you have had an exceedance of a monitored control equipment parameter or solvent emissions limit, the reason for the exceedance and the corrective actions taken must be reported.
- If you have had no exceedances of a monitored control equipment parameter or solvent emissions limit, or a piece of your machine's equipment has not needed to be repaired, or adjusted, such information shall be stated in your report. An example exceedance report form is included in Appendix F for your convenience.

After an exceedance, the frequency of reporting can be reduced to every six months if you meet the following requirements:

- Your machine has not had an exceedance for a year.
- You continue to comply with all of the monitoring and recordkeeping requirements for your machine.
- Your regulatory authority agrees to a reduction to a 6-month frequency.

2.3.5 Equivalency Request Report

If you want to use different equipment or procedures than those specified in the rule, you can apply for approval from your regulatory authority. In order to obtain approval you will need to demonstrate that the alternative equipment or procedures that you want to use are equivalent to those specified in the rule. For existing machines, you need to submit this application/report no later than June 3, 1996, in order to obtain an equivalency approval prior to the required compliance date. For new machines you need to submit this application/report and receive approval of that application prior to startup of your machine.

3.0

Batch Cold Cleaning Machine Requirements

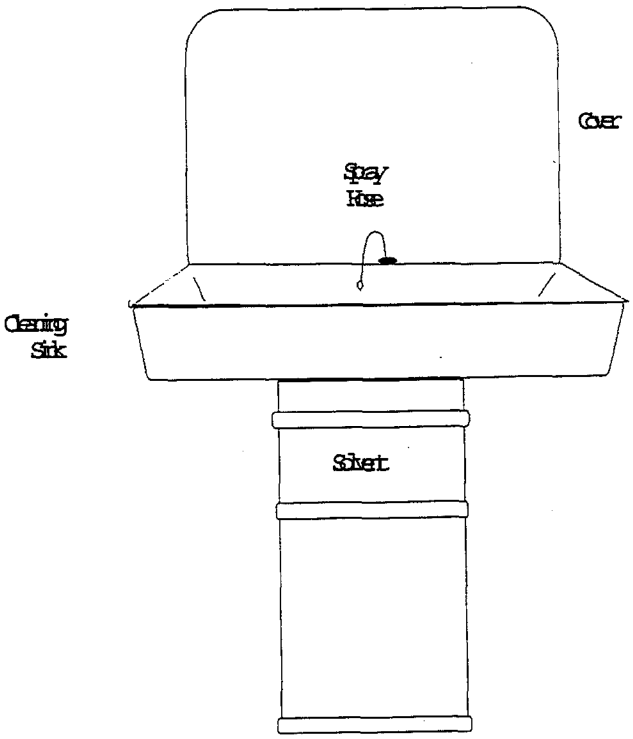
Batch cold cleaning machines must meet control equipment options and work practice requirements, except for machines with a water layer, which are exempt from work practices. The compliance options for this rule are on a per cleaning machine basis rather than a per facility basis. Therefore, the same compliance option does not have to be chosen for all of your machines.

Section 3.1 discusses the different types of cold cleaning machines. Section 3.2 presents the control equipment options and work practices required under the rule. Section 3.3 presents the monitoring, recordkeeping, and reporting requirements for batch cold cleaning machines.

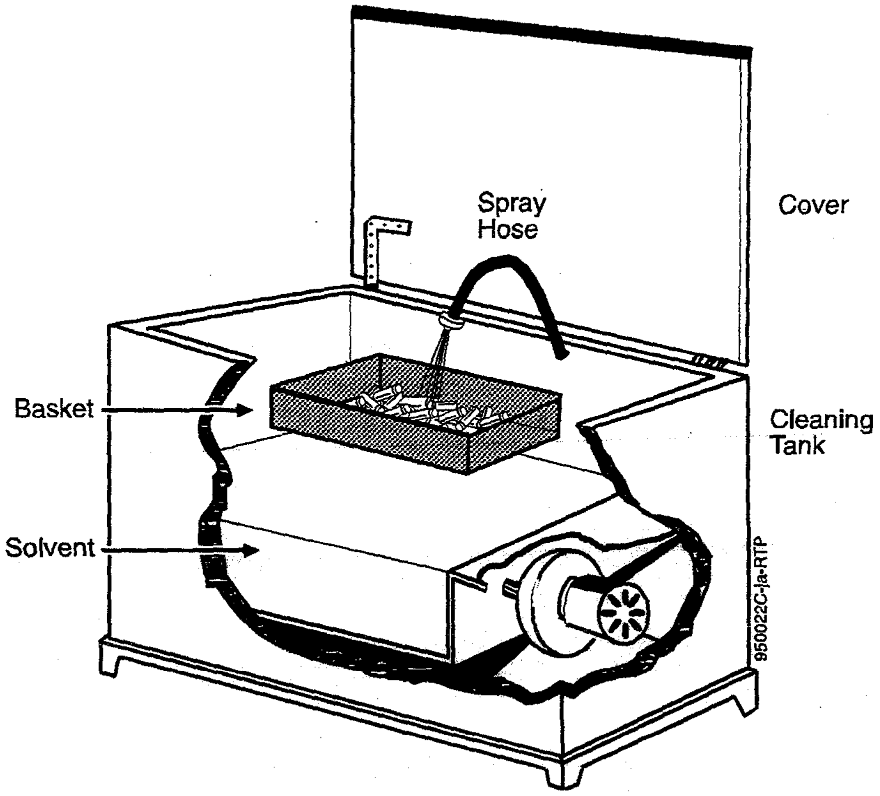
3.1 WHAT TYPE OF BATCH COLD CLEANING MACHINE DO YOU HAVE?

The two different types of batch cold machines covered by the rule are immersion and remote reservoir.

- Your machine is a <u>remote reservoir</u> batch cold cleaning machine if solvent is sprayed onto the parts in a sink-like work area and drains back into an enclosed container through a small drain (see Figure).



Remote Reservoir Cleaning Machine



Immersion Cleaning Machine

- Your machine is an immersion batch cold cleaning machine if parts are cleaned by immersing them in the solvent (see Figure). Note that an immersion machine may store solvent in a remote reservoir, but still considered an immersion machine if parts are immersed in the solvent. Small buckets, pails, and beakers with solvent capacities less than 7.6 liters (2 gallons) are not considered to be immersion cold cleaning machines.

3.2 CONTROL EQUIPMENT OPTIONS AND WORK PRACTICES

There are two control equipment combinations to choose from for an immersion cold cleaning machine, and one option equipment control for a remote reservoir cold cleaning machine.

If you have an immersion cold cleaning machine you must ensure that one of the following control equipment combinations is in place:

Cover and a 2.5 cm (1 in.) water layer

or

Cover and a 0.75 freeboard ratio or greater

If you have a remote reservoir cold cleaning machine you must ensure that it has a cover.

Table 2-8

Work Practice Requirements for Batch Cold Machines

Comply with the following work practices (machines with a water layer are exempt from work practices).

1. Store solvent waste in closed containers.
2. Flush parts in freeboard area.
3. Minimize the pooling of solvent on and in parts.
4. Do not fill machine above fill line.
5. Clean up spills immediately.
6. Store wipe rags in closed containers.
7. Do not agitate solvent to the point of causing splashing.
8. When cover is open, control room drafts.
9. Do not clean absorbent materials.

If you comply with the rule by using a cover and a 0.75 freeboard ratio or greater (for an immersion cold cleaning machine), or a cover (for a remote reservoir cold cleaning machine), you also need to comply with work practices (See Table 2-8).

3.3 MONITORING, REPORTING AND RECORDKEEPING REQUIREMENTS

An initial notification report and compliance report are required for batch cold cleaning machines. However, there are no additional monitoring, recordkeeping, or reporting requirements. Information to be included in these reports is presented below. Example reporting forms are included in Appendix G for your convenience. These forms are not required; any report format incorporating the required information would be acceptable.

3.3.1 Initial Notification Report

The initial notification report provides preliminary facility and cleaning machine information, and is used to notify the appropriate regulatory authority. The schedule for submitting the report depends on the status of the machine (i.e., new versus existing).

- A notification report for existing batch cold machines is due no later than August 29, 1995.
- A notification report for new batch cold machines, where construction or reconstruction and initial startup had not begun before December 2, 1994, is due as soon as possible before startup, but no later than January 31, 1995.
- A notification report for new batch cold machines, where construction or reconstruction began after December 2, 1994, is due as soon as possible before starting construction or reconstruction of the machine.

The initial notification report needs to include the following information for each cleaning machine:

- Your name and address;
- The address (i.e., physical location) of your machine;
- A description of your cleaning machine type (i.e., immersion batch cold cleaning machine, remote reservoir batch cold cleaning machine), solvent-air interface area, and existing controls;
- The installation date of your machine;
- Your anticipated equipment control combination compliance approach; and
- An estimate of annual halogenated solvent consumption for each machine.

3.3.2 Compliance Report

The Compliance Report is used to demonstrate to the appropriate regulatory authority that your machines are in compliance with the rule. It provides the control option chosen and a statement of compliance.

- The compliance report for existing machines is due no later than May 1, 1998.
- The compliance report for new machines is due no later than 150 days after startup or May 1, 1995, whichever is later.

The compliance report should include the following information for each cleaning machine:

- Your name and address;
- The address (i.e., physical location) of your machine;
- A statement, signed by you, stating that your batch cold machine is in compliance with the rule; and
- The method of compliance you chose for your machine.

Alternatives to Halogenated Solvent Cleaning

PART THREE

1.0
Introduction

Some owners or operators of halogenated solvent cleaners may decide to switch to alternative cleaning techniques rather than comply with the halogenated solvent cleaning NESHAP. In some cases, the decision to seek out an alternative solvent (for purposes of this document alternative means "non-halogenated") or cleaning process is an easy one. This is true in cases where solvents will no longer be available or will be available at a greatly increased cost due to restrictions or prohibitions on their manufacture (see Section 2.0 below). In other cases, alternatives are sought to meet a corporate objective to remove a particularly hazardous solvent from use. These corporate objectives are usually instituted for one or more of the following reasons:

- To reduce worker exposure;
- To reduce the cost of the storage, handling, management, and disposal of hazardous wastes;
- To comply with regulations; and
- To foster a positive public image.

No matter what the reason is for the search for an alternative solvent or cleaning process, the basic questions are the same - What are the alternatives, and what alternative should be chosen? Of course, due to differences in processes, cleaning needs, and other factors, the answers to these questions are not going to be the same for everyone. Luckily, you are not the first to ask these questions and therefore there are many alternatives out there covering a variety of applications and there are also many sources available that can help you choose among them. The information in this section is provided to help answer these questions and to show where you can go to find out more about alternative solvents.

2.0

Regulations to Consider

Many regulations exist that may limit or influence your choice of alternatives. Some regulations restrict or prohibit the manufacture of particular cleaning solvents, whereas other regulations control the use of solventsand the disposal of the waste they generate. Table 3-1 presents a list of some of the regulations, and corresponding Code of Federal Regulation citations, that you should consider when evaluating the availability and appropriateness of particular alternatives for your cleaning application needs. This list is not intended to be comprehensive, but rather to provide a starting point by including the regulations that are most likely to impact your decision. These regulations are briefly discussed in the following text.

2.1 CLEAN AIR ACT

The Clean Air Act (Act) mandates the protection and enhancement of the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of the nation's population. One of the primary goals of the Act is to encourage pollution prevention. Note that the Significant New Alternatives Policy Program - Title VI, New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants, Prevention of Significant Deterioration, State Implementation Plans, Acid Deposition Control, and the Halogenated Solvent Cleaning NESHAP are all mandated under the Act.

2.1.1 New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants

New source performance standards (NSPS) are standards developed to control emissions of criteria or designated pollutants. Emissions are controlled by source category. Standards apply to new, constructed, and modified sources for criteria and designated pollutants; and existing sources for designated pollutants. Criteria pollutants include nitrogen oxides (NOx), small Particulate Matter (PM 10), and volatile organic compounds (VOC). A number of VOC are cleaning solvents (e.g., glycol ethers, Stoddard solvent, xylene). You need to evaluate alternatives to determine whether their use would trigger the applicability of an NSPS. If an NSPS is triggered by any of your chosen alternatives, you need to consider the applicable NSPS requirements. An NSPS for new, modified, and reconstructed cold cleaning machines was proposed on September 9, 1994. The proposed NSPS for cold cleaning operations consists of a combination of equipment and work practice standards to limit the emissions of nonhalogenated VOC. The proposed equipment standards include covers, raised freeboards, solvent pump pressure design limits, and labels specifying work practices. The proposed work practices are required to assure the maximum effectiveness of a specific piece of control equipment, and will further reduce nonhalogenated VOC emissions. Promulgation of this NSPS is expected to be in September of 1995.

Table 3-1

Statute/Regulation Citations

Statute/Regulation	Citation[a]
New Source Performance Standard (NSPS)	40 CFR Part 60
National Emission Standard for Hazardous Air Pollutants (NESHAP)	40 CFR Parts 61 and 63
New Source Review (NSR)	40 CFR Parts 51 and 52
Protection of Stratospheric Ozone • Montreal Protocol	40 CFR Parts 9 and 82
Protection of Stratospheric Ozone • Significant New Alternatives Policy (SNAP)	40 CFR Parts 4 and 82
Acid Deposition Control (Acid Rain Program)	40 CFR Part 72
Pollution Prevention Act (PPA)	16 U.S.C. 13101-13109
Clean Water Act (CWA)	40 CFR Parts 108 to 503
Occupational Safety and Health Act Standards	29 CFR Part 1910
Resource Conservation and Recovery Act (RCRA)	40 CFR Parts 260 - 280

[a] Citations for CFR are as follows : (Title Number) CFR (Part Number).
Citations for U.S.C are as follows: (Title Number) U.S.C. (Section Number).

CFR = Code of Federal Regulations; published by the Office of the Federal Register. For sale by the U. S. Government Printing Office, Superintendent of Documents, Mail Stop: SSOP, Washington, DC 20402-9328

U.S.C= United States Code; law statutes through Acts of Congress.

National emission standards for hazardous air pollutants (NESHAP) are standards developed to control emissions of Section 112(b)(1) listed hazardous air pollutants (HAP). Emission standards are currently developed or scheduled to be developed for 174 categories of sources that emit HAP. This list can be amended and revised. Standards apply to new, reconstructed, modified, and existing sources. The halogenated solvent cleaner NESHAP is one of these NESHAP. If subject to the Aerospace Manufacturing and Rework Industry NESHAP, for example,
your choice in alternatives may be influenced. A brief description of the proposed Aerospace Manufacturing and Rework Industry NESHAP follows:

- The proposed NESHAP for the Aerospace Manufacturing and Rework Industry affects processes within an aerospace manufacturing and rework facility that release air toxics and VOC; these processes include cleaning operations, primer operations, topcoat operations, depainting operations, and chemical milling maskant operations. All aerospace manufacturing and rework facilities classified as a major source would be required to meet control requirements. Under the proposed rule, flush cleaning operations would require the use of one of the cleaning agents included on a list of approved solvents identified in the proposed rule or meet a specified vapor pressure limit.

Note that it is recommended that both NSPS and NESHAP be considered prior to making an alternative cleaning solvent determination. See Table 3-1 for citations for these rulemakings.

2.1.2 New Source Review (Including Prevention of Significant Deterioration-PSD)/State Implementation Plans

The New Source Review (NSR) program requires control of new and modified major sources of criteria, and regulated pollutants in attainment and nonattainment areas. Control requirements are determined on a case-by-case determination. Evaluation as to whether a potential alternative would trigger NSR needs to be considered when choosing your alternatives. However, since the amount of VOC (the most likely pollutant to be emitted) increase that would trigger NSR is large (i.e., 40 tons) and only applies to major sources, it is very unlikely that NSR would be triggered.

2.1.3 Protection of Stratospheric Ozone (Montreal Protocol)

Several programs, such as Title VI of the Act, are designed to protect the stratospheric ozone layer. The terms "Montreal Protocol" and "the Protocol" mean the Montreal Protocol on Substances that Deplete the Ozone Layer, a protocol to the Vienna Convention for the Protection of the Ozone Layer. This rule lists a number of chlorofluorocarbons, a few halons, carbon tetrachloride, 1,1,1-trichloroethane, and a number of hydrochlorofluorocarbons for production and consumption phase-out. Under the Montreal Protocol, regulations on the national recycling and emission reduction of these substances have also been drafted. Some facilities have successfully reduced many or eliminated 1,1,1-trichloroethane and chlorofluorocarbon 112 through the EPA's voluntary 33/50 program. Note that the list of targeted substances should be evaluated to determine whether any of your considered alternatives are on the list. See Table 3-1 for the citation for this rule.

2.1.4 Protection of Stratospheric Ozone (Significant New Alternatives Policy [SNAP])

The Significant New Alternatives Policy (SNAP) program is directed toward fulfilling the general policy contained in section 612 of identifying substitutes that can serve as replacements for ozone depleting substances, evaluating their effects on human health and the environment, and encouraging the use of those substitutes believed to present lower overall risks relative both to the ozone depleting compounds being replaced and to other substitutes available for the same end-use.

In the U.S., the two ozone depleting substances used as industrial solvents are CFC-113 (trifluorotrichloroethane) and 1,1,1-trichloroethane (methyl chloroform). The SNAP substitutes for these two chemicals when used in industrial cleaning equipment are the focus of alternative determinations for the solvent cleaning sector because this application comprises the largest use of ozone-depleting solvents. A list of the Agency's determinations on substitutes in the cleaning sector is available and may be found in the Federal Register.

For details of the SNAP program, refer to the rule (see Table 3-1 for the SNAP citation). For further information, contact the Stratospheric Ozone Information Hotline at 1-800-296-1996, or contact Sally Rand at (202) 233-9739, Substitutes Analysis and Review Branch, Stratospheric Protection Division, Office of Atmospheric Programs, Office of Air and Radiation.

2.2 POLLUTION PREVENTION ACT OF 1990

The Pollution Prevention Act (PPA) of 1990 recognizes the acknowledged preference that pollution be prevented or reduced at the source whenever feasible; and that when pollution cannot be prevented or recycled it should be treated in an environmentally safe manner. Under the PPA, disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe way. Therefore, it is important that you evaluate whether a substitute prevents or reduces pollution when making a decision on an alternative. See Table 3-1 for the citation for this rule.

2.3 CLEAN WATER ACT

The Clean Water Act (CWA) mandates the restoration and maintenance of the chemical, physical, and biological integrity of the Nation's waters. The CWA has mandated programs for preventing, reducing, or eliminating the pollution of navigable waters and ground waters and improving the sanitary condition of surface and underground waters. Discharges of any sewage, industrial wastes, or substance that may adversely affect such waters are regulated. Under the CWA, both conventional (e.g., biochemical oxygen demand, suspended solids, acidity and alkalinity) and nonconventional (e.g., toxicity) characteristics of effluent are regulated. It is important that you evaluate the characteristics of your alternatives carefully to ensure that direct discharges or discharges to a publicly owned treatment works are not subject to effluent limits or pretreatment requirements. See Table 3-1 for a reference to provisions under this Act.

2.4 OCCUPATIONAL SAFETY AND HEALTH ACT

The Occupational Safety and Health Act (OSHA) mandates safe and healthful working conditions for every working man and woman in the Nation, thereby preserving human resources. Under the Occupational Safety and Health Act, permissible exposure and explosion limits for a number of chemical compounds are required to be followed in the work place. Contact, handling, and respiratory protective gear may also be required. When evaluating alternatives, ensure that your alternatives meet the appropriate explosion and exposure limits and that workers are properly protected to ensure worker safety. In choosing among your alternatives, you may decide that the safety risk associated with some of the compounds regulated under OSHA outweighs the cleaning benefits. See Table 3-1 for the citation to the provisions under this Act.

2.5 RESOURCE CONSERVATION AND RECOVERY ACT

The Resource Conservation and Recovery Act (RCRA) mandates that the generation of hazardous waste be reduced or eliminated wherever possible. Waste that is generated must be treated, stored, or disposed of in such a way as to minimize the present and future threat to human health and the environment. When evaluating alternatives, ensure that, if your chosen alternative is regulated under RCRA, you must follow all waste handling and reporting requirements. Note that the burden associated with waste handling and reporting requirements mandated under RCRA may be an impetus for you to choose an alternative not regulated under RCRA. See Table 3-1 for a reference to this rule.

2.6 FIRE CODES/INSURANCE ISSUES

Another consideration when evaluating your alternatives is whether your choice of alternatives will affect or trigger fire code regulations. You may also need to reevaluate your insurance based on the alternative you choose. For example, if your alternative choice is highly flammable, special protective measures may be required and you may need to increase or adjust your fire insurance.

3.0

Identifying Alternatives

Before looking for alternative cleaning processes, you should have a clear picture of your current cleaning requirements. The discussion in Section 3.1 will help you to define these requirements. Identifying alternatives that meet these requirements can be made easier by utilizing existing guidance materials and information sources discussed in Section 3.2 and Section 3.3.

3.1 DEFINE YOUR CLEANING REQUIREMENTS

The first step in identifying alternative solvents and/or cleaning processes is to clearly define your cleaning needs. The following are some questions that you should answer:

- What are you cleaning?
    - What size?
    - What is the part configuration (e.g., blind holes)?
- Why are you cleaning it?

    - What is being removed?
    - Is the solvent also drying the part or being used as a defluxing agent?
- How clean does it have to be?
    - Do you have to meet military specifications?
    - Are there other specifications that must be met?
    - Can the specifications be changed?
- What is the previous/next process?
    - Does it really need to be cleaned at this point? In other words, is the part already clean? Or, are you cleaning the part before a process step where it does not matter whether it is clean or not? Or, can the process steps be reordered or modified to eliminate cleaning steps?
    - Is there a process time restriction?
    - Does the cleaning need to be in-line or batch?
    - Are parts cleaned on a regular basis or infrequently?

Some companies have found it useful to put this information into a table or a matrix. This way they have a brief summary of their current cleaning needs that they can refer to quickly when evaluating alternatives. Table 3-2 is an example of a table that can be used to summarize your cleaning requirements. A blank cleaning requirement form is included in Appendix H. This form is <u>not</u> required, but has been created for your convenience.

Once you have identified your cleaning needs the next step is to identify alternatives that fit those needs. It should be noted that many of the companies that have substituted alternatives for their cleaning solvents or processes have found that there are generally no universal answers or one-for-one replacements. In other words, if you have five different cleaning machines that use TCA to clean several different types of parts, you may not find one alternative that is suitable for cleaning all of them. It may take a combination of several different technologies to fulfill your cleaning requirements.

3.2 IDENTIFYING ALTERNATIVES USING SAGE

One possible way to identify alternatives that meet your cleaning needs is to use the Solvent Alternatives GuidE (SAGE). The SAGE is an interactive database developed by the EPA that can provide you a list of candidate replacements for your current solvent. The output of SAGE is a scored list of possible replacements, which is generated based on information you provide at the various menu prompts. The criteria used by SAGE to identify alternatives are based on cleaning requirements and do not address adverse health effects. It is suggested that once you have identified an alternative solvent that meets your cleaning needs that you investigate whether it has any adverse health effects.

Table 3-2

Example Cleaning Requirements Table

Requirement/Description	Fill in For Each Part/Cleaning Process
Part	
Name	Engine Can
Type	Assembly
Size	One foot long
Material	Nickel
Volume	0.5 cubic foot
Shape (blind holes?)	Blind holes and seams
Coating	No
Cleaned Regularly or Infrequently	Regularly
Used in a Clean Room	No
Need to be Dry	Yes
High Dollar Value	Yes
Ultrasonics Harmful	No
Sensitive to High Atmospheric Pressure	No
Sensitive to High Temperature	No
Contaminant	
Type	Metal fines, oils
Water Soluble	No

Table 3-2 (Continued)

Requirement/Description	Fill in For Each Part/Cleaning Process
Current Cleaning Process	
Chemistry	Methyl chloroform
Equipment	Vapor degreaser
Water Supply	Tap
Cleanliness Specification	Yes, client specified. Non-military
Cleaning Time Restriction	Yes. In-line process.
Following/Previous Process	Shipping/Final sanding
Production Rate/Batch vs. In-line	High Volume/In-Line

The SAGE system can be accessed by modem from the EPA's Technology Transfer Network (TTN) by dialing (919) 541-5742 for a 1200, 2400, 9600 or 14400 bps modem. From the main menu in the TTN select the CTC section. Assistance for the TTN can be obtained by calling (919) 541-5384. In addition, SAGE can be purchased from the National Technical Information Service (NTIS) by calling (703) 487-4650. A users manual for SAGE is provided in Appendix H. The following is a brief summary of some of SAGE's capabilities.

When using SAGE you are prompted, through a series of questions, to describe your current solvent application. The questions include subjects such as the material the part is made of; it's size, shape, and complexity; the contaminant types; the chemistry (solvent) presently used; sturdiness of the part; etc.

After input of the data, SAGE analyzes the application and scores each combination of chemistries and cleaning processes for that specific application. Table 3-3 contains a list of the chemistries and cleaning processes in the SAGE libraries. The alternatives are ranked based on an applicability score, ranging from 0 (poor or no match) to 100 (best match).

You can then design the type of report that you desire. Per your instructions, a detailed report of the technologies and chemistries recommended by SAGE will be printed. You can select the best matches for your application (i.e., those that exhibit an applicability score in the range of 75 to 100) or you can select a broader list that includes descriptions of those technologies that appear less likely to match the application (i.e., those with scores of 74 or less). A vendor list can also be printed.

Within the individual reports are comments about the following considerations you must evaluate to ascertain whether a technology is a likely match for your application:

- General process-related information
- Environmental issues,
- Safety issues, and
- Economics

The individual reports also contain useful case studies.

Included in the SAGE database are brief and detailed descriptions for each of these chemistries and cleaning processes. Appendix H contains brief descriptions for each of the chemistries and processes. Appendix H also contains an example of one of the detailed summaries (i.e., for high pressure spray).

Table 3-3

Alternative Cleaning Chemistries Described in the SAGE Program

Chemistries in SAGE	
Acetone	Ethyl lactate (lactate esters)
Acidic aqueous chemistries	Neutral aqueous chemistries
Alcohol	N-methyl pyrolidone (NMP)
Alkaline aqueous chemistries	Petroleum distillates
Aqueous chemistry additives (surfactants, builders, etc.)	Pure water
Dibasic ethers (DBE)	Terpenes
Glycol ethers	
Cleaning Processes in SAGE	
Abrasives	Paint stripping
Brushing	PCBA (printed circuit board) cleaning
Carbon dioxide pellets	Plasma cleaning
Carbon dioxide snow	Power washers
Fiberglass mold cleaning	Semiaqueous processes
High pressure sprays	Steam
Immersion cleaning	Supercritical fluids
Laser ablation	Ultrasonics
Low pressure sprays	UV/Ozone cleaning
Megasonics	Wiping
No clean options	Xenon flash lamps

3.3 OTHER METHODS OF IDENTIFYING ALTERNATIVES

Other methods of identifying alternative cleaning solvents and processes include vendors and other users.

Vendors are often an excellent source of information on alternatives. Information from vendors is generally restricted to their products and therefore will tend not to be as broad as SAGE. However, many vendors do extensive testing of their solvents and cleaning processes on a variety of applications, and usually will do trial cleaning of your part for free. The EPA maintains a list of solvent vendors that can be obtained by calling the U.S. EPA's Stratospheric Ozone Information Hotline at (800) 296-1996.

Often times there are other companies out there that have or are going through a similar alternative evaluation process. Many companies are more than happy to share their successes.

The following two U.S. EPA publications may provide valuable information that can be used when identifying your alternatives:

- Guide to Cleaner Technologies: Alternatives to Chlorinated Solvents for Cleaning and Degreasing; and
- Guide to Cleaner Technologies: Cleaning and Degreasing Process Changes.

4.0 Choosing Between Different Alternatives

The process of deciding which of the identified alternatives will be used is a highly variable and generally user-specific process. However, there are some factors that should be considered that are common to most situations. Below is a list of these factors, some of which have already been discussed.

Regulations -	Look at Section 2.0 of this part and determine whether the alternative is covered under one of these regulations. This should include a consideration of the water impacts.
Training -	Will the alternative require extensive training of cleaning personnel? If so, this cost and time should be accounted for in your estimates.
Maintenance -	What type of maintenance will the alternative require? Will there be more or less down time?
Production Rate -	How will the alternative affect your production rate? Decreased productivity should be included in your cost estimates.

Odor - Does the alternative have a strong odor? This might require additional ventilation or other modifications.

Compatibility - Is the new solvent or process compatible with the materials you are cleaning? For example, aqueous solvents may cause rust damage on your parts or a high pressure spray may damage delicate parts.

Safety - Is the new system safe to operate? Consider flammability, odors, harmful fumes, physical dangers, etc. Don't trade one hazard for another.

Cost - As mentioned above many factors play a role in the overall cost of an alternative. Many companies have found that switching to alternatives can result in a cost savings over a number of years.

Recoverability - Can the solvent/cleaning media be recovered and reused or recycled?

Proven in Industry - Is the technology only a prototype or has it been proven in industry for similar applications? If so, contact other users.

As mentioned previously, some vendors will test clean your parts so you can evaluate the cleaning efficiency of their cleaning chemistry or process. Some corporations have conducted their own lab tests and shop tests to evaluate the potential alternatives that they have identified. Some companies have found it useful to create a matrix or table summarizing the pros and cons of each potential alternative. If staff is available, it might be beneficial to form a multi-disciplinary team to address requirements for alternative cleaners, to oversee the field evaluations, and to document that the process or chemistry changes are implemented. Many corporations have indicated that satisfactory substitutes are known for almost all cleaning requirements.

Glossary

Air blanket means the layer of air inside the solvent cleaning machine freeboard located above the solvent-air interface. The center of the air blanket is equidistant between the sides of the cleaning machine.

Area source, as defined in 40 CFR Part 63, Subpart A, means any stationary source of hazardous air pollutants that is not a major source as defined here (see major source definition).

Automated parts handling system means a mechanical device that carries all parts and parts baskets at a controlled speed from the initial loading of soiled parts through the removal of the cleaned parts. Automated parts handling systems include, but are not limited to, hoists and conveyors. See part Two, Section 2.1.1, for an illustration of an automated parts handling system.

Carbon Adsorber means a bed of activated carbon into which an air-solvent gas-vapor stream is routed and that adsorbs the solvent on the carbon.

Clean liquid solvent means fresh unused solvent, recycled solvent, or used solvent that has been cleaned of soils (e.g., skimmed of oils or sludge and strained of metal chips). It was not intended that you should dispose of usable solvent. It was intended that all metal and dirt soils be removed from the machine so that solvent emissions are not underestimated.

Construction means the on-site fabrication, erection, or installation of an affected source.

Cover means a lid, top, or portal cover that shields the solvent cleaning machine openings from air disturbances when it is in place and is designed to be easily opened and closed without disturbing the vapor zone. Air disturbances include, but are not limited to, lip exhausts, ventilation fans, and general room drafts. Types of covers include, but are not limited to, sliding, biparting, and roll-top covers.

Downtime mode means the time period when a solvent cleaning machine is not cleaning parts and the sump heating coils, if present, are turned off.

Dwell means the technique of holding parts within the freeboard area but above the vapor zone of the solvent cleaning machine. Dwell occurs after cleaning to allow solvent to drain from the parts or parts baskets back into the solvent cleaning machine.

Existing cleaning machine means a cleaning machine constructed or reconstructed on or before November 29, 1993.

Freeboard height means; for a batch vapor cleaning machine, the distance from the solvent-air interface, as measured during the idling mode, to the top of the cleaning machine; For an in-line cleaning machine, it is the distance from the solvent-air interface to the bottom of the entrance or exit opening, whichever is lower as measured during the idling mode. The freeboard height for a batch cold cleaning machine is the distance from the solvent fill line (the lie that the sump is filled to) to the lip of the cleaning machine.

Freeboard ratio means the ratio of the solvent cleaning machine freeboard height to the smaller interior dimension (length, width, or diameter) of the solvent cleaning machine. For example, if the height of the freeboard is 2 meters and the smaller interior dimension is 1.8 meters, the freeboard ratio would be 2 meters/1.8 meters or 0.9.

Freeboard refrigeration device (also called a chiller) means a set of secondary coils mounted in the freeboard area that carries a refrigerant or other chilled substance to provide a chilled air blanket above the solvent vapor.

Freeboard zone, for a batch vapor cleaning machine, means the area from the solvent-air interface, as measured during the idling mode, to the top of the cleaning machine; for an in-line cleaning machine, it is the area within the solvent cleaning machine that extends from the solvent-air interface to the bottom of the entrance or exit opening, whichever is lower. The freeboard zone for a batch cold cleaning machine is the area from the solvent fill line (the line that the sump is filled to) to the lip of the cleaning machine.

Hoist means a mechanical device that carries the parts and parts baskets from the loading area into the solvent cleaning machine and to the unloading area at a controlled speed. A hoist may be operated by controls or may be programmed to cycle parts through the cleaning cycle automatically.

Idling mode means the time period when a solvent cleaning machine is turned on but is not actively cleaning parts.

Idling-mode cover means any cover or solvent cleaning machine design that allows the cover to shield the cleaning machine openings during the idling mode. A cover that meets this definition can also be used as a working-mode cover if that definition is also met.

Lip exhaust means a device installed at the top of the opening of a solvent cleaning machine that draws in air and solvent vapor emissions from the freeboard area and ducts the air and vapor away from the solvent cleaning area.

Major source, as defined in 40 CFR Part 63, Subpart A, means any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit considering controls, in the aggregate, 10 tons per year or more of any hazardous air pollutant or 25 tons per year or more of any combination of hazardous air pollutants, unless the authority (e.g., approved Title V permitting authority) establishes a lesser quantity, or in the case of radionuclides, different criteria from those specified in this sentence.

New cleaning machine means a solvent cleaning machine the construction or reconstruction of which is commenced after November 29, 1993.

Potential to emit, as defined in 40 CFR Part 63, Subpart A, means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the stationary source to emit a pollutant, including air pollution equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable.

For solvent cleaning machines, potential to emit is determined on the basis of the yearly hours of operation, the working-mode uncontrolled emission rate, and the solvent/air interface area. Unless otherwise restricted by a federally enforceable requirement, the hours of operation must be based on the total number of hours in a year (8,760 hours). A facility's total potential to emit is the sum of the HAP emissions from all solvent cleaning operations, plus all HAP emissions from other sources within the facility.

Primary cleaning time means the amount of time it takes a part to reach the vapor zone temperature.

Primary condenser means a series of circumferential cooling coils on a vapor cleaning machine through which chilled liquid or gas is circulated or recirculated to provide continuous condensation of rising solvent vapors and, thereby, create a controlled vapor zone.

Reconstruction, as defined in 40 CFR Part 63, Subpart A, means the replacement of components of an affected or a previously unaffected stationary source to such an extent that:

(1) The fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable new source; and

(2) It is technologically and economically feasible for the reconstructed source to meet the relevant standard(s) established by the Administrator (or a State) pursuant to Section 112 of the Act. Upon reconstruction, an affected source, or a stationary source that becomes an affected source, is subject to relevant standards for new sources, including compliance dates, irrespective of any change in emissions of hazardous air pollutants from that source.

Reduced room draft means decreasing the flow or movement of air across the top of the freeboard area of the solvent cleaning machine to less than or equal to 15.2 meters per minute (50 feet per minute). Methods of achieving a reduced room draft include, but are not limited to, redirecting fans and/or air vents so that they do not blow across the cleaning machine, moving the cleaning machine to a corner where there is less room draft, and constructing a partial or complete enclosure around the cleaning machine.

Solvent fill line means the line, typically on the interior of a solvent cleaning machine sump, that indicates the level to which the cleaning machine should be filled with solvent

Solvent-air interface, means; for a vapor cleaning machine, the location of contact between the concentrated solvent vapor layer and the air. This location of contact is defined as the midline height of the primary condenser coils; for a cold cleaning machine, it is the location of contact between the liquid solvent and the air.

Solvent-air interface area for a vapor cleaning machine, means the surface area of the solvent vapor zone that is exposed to the air. For an in-line cleaning machine, it is the total surface area of all the sumps; for a cold cleaning machine, it is the surface area of the liquid solvent that is exposed to the air.

Solvent vapor zone, for a vapor cleaning machine, means the area that extends from the liquid solvent surface to the level at which the solvent vapor is condensed. This level is defined as the midline height of the primary condenser coils.

Sump means the part of a solvent cleaning machine where the liquid solvent is located.

Super-heated vapor system means a system that heats the solvent vapor, either passively or actively, to at least 10 degrees Fahrenheit (5 degrees Celsius) above the solvent's boiling point. Parts are held in the super-heated vapor before exiting the machine to evaporate the liquid solvent on them. Hot vapor recycle is an example of a Super-heated vapor system.

Water cover, for a cold cleaning machine, means a layer of water that floats above denser solvent and provides control of solvent emissions. If the solvent used is not denser than water, a water layer (water cover) will not float above your cleaning solvent and control solvent emissions. In many cases the solvent used in batch cold cleaning machines is sold containing the appropriate amount of water to create a water cover.

Working-mode means the time period when the solvent cleaning machine is actively cleaning parts.

Working-mode cover means any cover or solvent cleaning machine design that allows the cover to shield the cleaning machine openings from outside air disturbances during the working mode (i.e., while parts are in the cleaning machine) and during the idling and downtime modes. A working-mode cover is opened only during parts entry and removal. A cover that meets this definition can also be used as an idling-mode cover if that definition is also met.

Conversion Chart

Multiply	By	To Obtain
Centimeters	0.3937	Inches
Cubic centimeters	3.531 x 10^{-5}	Cubic feet
Cubic centimeters	6.10 x 10^{-2}	Cubic inches
Cubic centimeters	10^{-6}	Cubic meters
Cubic feet	0.02832	Cubic meters
Cubic inches	5.787 x 10^{-4}	Cubic feet
Cubic inches	16.39	Cubic centimeters
Cubic meters	10^{6}	Cubic centimeters
Cubic meters	35.31	Cubic feet
Cubic meters	61,023	Cubic inches
Cubic yards	7.646 x 10^{5}	Cubic centimeters
Cubic yards	27	Cubic feet
Cubic yards	0.7646	Cubic meters
Feet per minute	0.01829	Kilometers per hour
Feet per minute	0.3048	Meters per minute
Gallons	0.1337	Cubic feet
Kilograms	2.2046	Pounds
Kilograms	1.102 x 10^{-3}	Tons (short)
Kilograms per cubic meter	0.06243	Pounds per cubic foot
Kilograms per cubic meter	3.61 x 10^{-5}	Pounds per cubic inch
Meters	100	Centimeters
Meters	3.2808	Feet
Meters	39.37	Inches
Meters per minute	1.667	Centimeters per second
Meters per minute	3.281	Feet per minute

Multiply	By	To Obtain
Meters per minute	0.05468	Feet per second
Meters per second	1968	Feet per minute
Meters per second	3.284	Feet per second
Pounds	453.6	Grams
Pounds	16	Ounces
Pounds	0.4536	Kilograms
Pounds per cubic foot	0.01602	Grams per cubic centimeter
Pounds per cubic foot	16.02	Kilograms per cubic meter
Pounds per cubic foot	5.787×10^{-4}	Pounds per cubic foot
Pounds per cubic foot	1728	Pounds per cubic foot
Pounds per foot	1.488	Kilograms per meter
Pounds per inch	178.6	Grams per centimeter
Pounds per square foot	4.882	Kilograms per square meter
Pounds per square foot	6.944×10^{-3}	Pounds per square inch
Pounds per square inch	703.1	Kilograms per square
Pounds per square inch	144	Pounds per square foot
Square feet	144	Square inches
Square feet	0.09290	Square meters
Square inches	6.452	Square centimeters
Square inches	6.944×10^{-3}	Square feet
Square meters	10.764	Square feet
Square yards	0.8361	Square meters
Yards	91.44	Centimeters
Yards	3	Feet
Yards	36	Inches
Yards	0.9144	Meters

APPENDIX F

NESHAPS
RULE

NATIONAL EMISSION STANDARDS
FOR
HAZARDOUS AIR POLLUTANTS:

HALOGENATED SOLVENT CLEANING

Federal Resister,
December 2 and 30, 1994

12-2-94
Vol. 59 No. 231

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Friday
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property in all National Housing Act mortgage and loan insurance programs that are excluded from the "one-to-four-family residential property" definition, unless completely excluded from the rule under § 267.1(b)."

7. On page 50461, in the preamble, in the third column, 12 lines from the bottom, correct the cross-reference "§ 267.3(b)(2)" to read "§ 267.3(c)(2)".

8. On page 50464, in column two, in § 267.1, paragraph (a) is corrected by adding a sentence at the end to read as follows:

§ 267.1 Applicability.

(a) * * * Some provisions of § 267.3(c) also apply to the multifamily risk-sharing program under part 266 of this chapter as provided in § 266.15(b)(8) of this chapter.

§ 267.2 [Corrected]

9. On page 50464, in column three, in § 267.2, in the definition for "*Single family program*", "§ 267.5(c)" is corrected to read, "§ 267.5".

§ 267.3 [Corrected]

10. On page 50465, in column one, in § 267.3, paragraph (c)(3) is corrected by removing the paragraph designations for paragraphs (c)(3) (i), (ii), and (iii), and running the text together to form a single paragraph (c)(3).

§ 267.9 [Corrected]

11. On page 50468, in column one, in § 267.9, in line 15, correct "Appraisal Foundation" to read "Appraisal Subcommittee".

§ 267.12 [Corrected]

12. On page 50468, in column three, § 267.12 is corrected by adding a period at the end of paragraph (a)(3) after the word "Order", and by removing "; or" and paragraph (a)(4).

13. On page 50469, beginning in column one, § 267.12 is corrected by removing paragraph (b)(3).

Dated: November 28, 1994.

Nicolas P. Retsinas,

Assistant Secretary for Housing—Federal Housing Commissioner.

[FR Doc. 94–29685 Filed 12–1–94; 8:45 am]

BILLING CODE 4210–27–P

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 9 and 63

[AD-FRL-5111-3]

RIN 2060–AC31

National Emission Standards for Hazardous Air Pollutants: Halogenated Solvent Cleaning

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule and test method.

SUMMARY: This final rule promulgates national emission standards for hazardous air pollutants for halogenated solvent cleaners. These standards implement section 112 of the Clean Air Act (Act) and are based on the Administrator's determination that halogenated solvent cleaning machines emit halogenated organic chemicals identified in the Act list of 189 hazardous air pollutants (HAP). The halogenated solvent cleaner NESHAP requires batch vapor solvent cleaning machines and in-line solvent cleaning machines to meet emission standards reflecting the application of the maximum achievable control technology for major and area sources; area source batch cold cleaning machines are required to achieve generally available control technology. The rule regulates the emissions of the following halogenated HAP solvents: methylene chloride (MC), perchloroethylene (PCE), trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), carbon tetrachloride (CT), and chloroform (C).

The EPA is also finalizing Method 307 with the standard. This method can be used to demonstrate compliance with the idling standard.

EFFECTIVE DATE: December 2, 1994. See Supplementary Information section concerning judicial review.

ADDRESSES: *Background Information Document.* The background information document (BID) for the promulgated standards may be obtained from the U.S. EPA Library (MD–35), Research Triangle Park, North Carolina 27711, telephone number (919) 541–2777. Please refer to "National Emission Standards for Hazardous Air Pollutants, Halogenated Solvent Cleaning—Background Information for Final Standards," EPA No. 453/R–94–071. The BID contains: (1) a summary of all the public comments made on the proposed standards and the Administrator's response to the comments; and (2) a summary of the changes made to the standards since proposal. A reasonable fee may be charged for copying.

Docket. A docket, No. A–92–39, containing information considered by the EPA in development of the promulgated standards, is available for public inspection between 8:00 a.m. and 4:00 p.m., Monday through Friday, at the following address: U.S. Environmental Protection Agency, Air and Radiation Docket and Information Center (formerly known as the Air Docket) (MC–6102), 401 M Street SW., Washington, DC 20460 (phone: (202) 260–7548). The docket is located at the above address in Room M–1500, Waterside Mall (ground floor). A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: For information concerning the final standard, contact Mr. Paul Almodóvar, Coatings and Consumer Products Group, Emission Standards Division (MD–13), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 27711, telephone number (919) 541–0283.

SUPPLEMENTARY INFORMATION: National emission standards for hazardous air pollutants (NESHAP) for halogenated solvent cleaners were proposed in the **Federal Register** on November 29, 1993 (58 FR 62566). This **Federal Register** action announces the EPA's final decisions on the rule. Under section 307(b)(1) of the Act, judicial review of the NESHAP is available only by the filing of a petition for review in the U.S. Court of Appeals for the District of Columbia Circuit within 60 days of today's publication of this rule. Under section 307(b)(2) of the Act, the requirements that are the subject of today's notice may not be challenged later in civil or criminal proceedings brought by the EPA to enforce these requirements.

I. The Standards

National emission standards for major sources of hazardous air pollutants established under section 112 of the Act reflect:

> "* * * the maximum degree of reduction in emissions of the HAP * * * that the Administrator, taking into consideration the cost of achieving such emission reduction, and any nonair quality health and environmental impacts and energy requirements, determine is achievable for new or existing sources in the category or subcategory to which such emission standards applies * * *" (the Act section 112(d)(2)).

Area sources are regulated with a MACT standard, unless there is justification for regulating them under GACT.

The promulgated standard includes multiple alternatives to allow owners or operators maximum compliance flexibility. These alternatives include an equipment standard, in conjunction with work practice requirements, and an alternative overall solvent emissions standard. The idling emission limit and the alternative overall solvent emission standard are not available to owners or operators of batch cold cleaning machines.

If an owner or operator of a batch vapor or in-line cleaning machine elects to comply with the equipment standard, they must install one of the control combinations listed in the regulation, use an automated parts handling system to process all parts, and follow multiple work practices. As an alternative to selecting one of the equipment control combinations listed in the regulation, an owner or operator may demonstrate that the batch vapor or in-line cleaning machine can meet the idling mode emission limit specified in the standards. In addition to maintaining this idling mode emission limit, the owner or operator of a batch vapor or in-line solvent cleaning machine must use an automated parts handling system to process all parts and comply with the work practice standards. A third alternative for complying with these standards is to comply with the overall solvent emissions limit. An owner or operator complying with the overall solvent emissions limit is required to ensure that the emissions from each solvent cleaning machine are less than or equal to the solvent emission levels specified in the standard. Under this alternative standard, an owner or operator is not required to use an automated parts handling system or to comply with the work practice standards.

The batch cold cleaning machine standard is an equipment standard. However, those owners or operators choosing the equipment options without the water layer must also comply with work practice requirements. There is no idling standard or overall solvent emissions standard for batch cold cleaning machines. Batch cold cleaning machines located at nonmajor sources are exempt from title V permit requirements.

Section 114(a)(3) of the amended CAA requires enhanced monitoring and compliance certification of all major stationary sources. The annual compliance certifications certify whether compliance has been continuous or intermittent. Enhanced monitoring shall be capable of detecting deviations from each applicable emission limit or standard with sufficient representativeness, accuracy, precision, reliability, frequency and timeliness to determine if compliance is continuous during a reporting period. The monitoring in this regulation satisfies the requirements of enhanced monitoring.

II. Summary of Impacts

These standards will reduce nationwide emissions of hazardous air pollutants (HAP) from halogenated solvent cleaning machines by 77,400 Mg/yr (85,300 tons per year), or 63 percent by 1997 compared to the emissions that would result in the absence of the standards. No adverse secondary air impacts, water or solid waste impacts are anticipated from the promulgation of these standards.

The national annual energy usage due to the installation of the required control devices is expected to increase from 12.9 million KWH/yr to 66.9 million KWH/yr, which is equivalent to approximately 29.3 thousand barrels of oil. These estimates do not include energy savings from reduced solvent use.

The implementation of this regulation is expected to result in an overall annual national net savings of $19 million. This includes a net annualized savings from installation of control devices of $30.5 million and a total monitoring, reporting, and recordkeeping costs of $11.6 million. These savings will come from the significant decrease in solvent emissions and, therefore, solvent consumption, which outweigh the overall cost of air pollution control equipment and monitoring and recordkeeping costs.

The economic impact analysis done at proposal showed that the economic impacts from the proposed standard would be insignificant. The economic impact analysis has not been revised for promulgation because the changes in costs are not expected to have any effect on the results of the analysis. While the estimated annual costs for the regulation have increased since proposal, there are still cost savings for most affected entities. Only entities with small or medium-sized cleaning machines will not have cost savings, and the costs for the selected regulatory alternatives for these entities have changed very little since proposal. Since those entities that do not have cost savings were the only ones analyzed in the proposal, and these costs have changed little, the results from the economic impact analysis at proposal should still hold for promulgation.

III. Significant Changes to the Proposed Standards

A. Public Participation

Prior to proposal of the standards, interested parties were advised by public notice in the **Federal Register** (57 FR 46854), of a meeting of the National Air Pollution Control Techniques Advisory Committee to discuss the halogenated solvent cleaner source recommended for proposal. This meeting was held on November 17 and 18, 1992. The meeting was open to the public and each attendee was given an opportunity to comment on the standards recommended for proposal.

The standards were proposed and published in the **Federal Register** on November 29, 1993 (58 FR 62566). The preamble to the proposed standards discussed the availability of the BID, which described the regulatory alternatives considered and the impacts of those alternatives. Public comments were solicited at the time of proposal, and copies of the BID were distributed to interested parties.

To provide interested persons the opportunity for oral presentation of data, views, or arguments concerning the proposed standards, a public hearing was offered at proposal; however, one was not requested. The public comment period was from November 29, 1993 to January 28, 1994. Fifty-seven comment letters were received. The comments have been carefully considered, and changes have been made in the proposed standards when determined by the Administrator to be appropriate.

B. Comments on the Proposed Standards

Comments on the proposed standards were received from 57 commenters composed mainly of States, solvent cleaning machine users, solvent cleaning machine vendors, industry and industry trade associations. A detailed discussion of these comments and responses can be found in the promulgation BID, which is referenced in the ADDRESSES section of this preamble. The summary of comments and response in the BID serve as the basis for the revisions that have been made to the standards between proposal and promulgation. Most of the comment letters contained multiple comments. The comments have been divided into the following areas:

- Selection of pollutants and source categories for regulation.
- Emission control options.
- Regulatory alternatives.
- Benefits analysis/economics.

- Equipment, idling, work practice and overall solvent emission limit standards.
- Modification and reconstruction considerations.
- Monitoring requirements.
- Recordkeeping and reporting requirements.
- Operating permit program.
- Clarifications.
- Miscellaneous.

C. Significant Changes

Several changes have been made since the proposal of these standards. The majority of the changes have been made to clarify portions of the rule that were unclear to the commenters. Other changes include adding additional control combinations and an equation that allows cleaning machines that do not have a solvent vapor/air interface area to comply with the standard by meeting a solvent emission limit based on cleaning capacity. A summary of the major changes is presented below.

(1) Several comments were made about the complexity of the rule, with many commenters offering suggested changes to clarify different sections. Many of these recommendations have been incorporated into the final rule. For example, the standards for batch cold cleaning machines have been moved to a separate section, the operator test has been included as appendix B, and a table summarizing the applicability of the General Provisions to this rule has been included in appendix C.

(2) The applicability section of the rule has been clarified to ensure that the standard regulates only those solvents originally intended for inclusion; namely, MC, PCE, TCE, TCA, CT, and C. Several commenters were concerned that, as proposed, the rule could be interpreted to regulate non-halogenated solvents contaminated by trace amounts of halogenated solvent. The EPA never intended for these solvents to be included in these standards.

(3) An equation and table have been added to allow solvent cleaning machines that do not have a solvent vapor/air interface area to comply with these standards. Several new cleaning machines are currently being developed by industry that cannot install the equipment control devices included in this final rule, do not have an idling mode, and do not have a solvent vapor/air interface area to relate to the solvent emission limit. The equation and table in the rule allow owners or operators of halogenated solvent cleaning machines without a solvent vapor/air interface area to comply with the standard by meeting an overall solvent emissions limit based on cleaning capacity that is equivalent to the overall solvent emissions limit for machines with a solvent vapor/air interface.

(4) The list of equipment combinations has been modified to remove overlapping controls and to add carbon adsorbers to the control combinations.

There are multiple control combinations available for meeting the rule, many of which are pollution prevention measures. Many of these options also reduce worker exposure. However, some sources may rely on lip exhausts instead in order to meet OSHA requirements. Use of a lip exhaust without any controls, while reducing worker exposure on the one hand, would dramatically increase the overall emissions to air. Thus, if lip exhausts are used on solvent cleaning machines, the rule requires carbon adsorption controls (which have been added explicitly as a control option in the final rule). Although the lip exhaust-carbon adsorption combination reduces worker exposure and overall emissions to air, it may impose additional cost and burden on sources as well as on the environment for a number of reasons. First, carbon adsorption units are generally more expensive than other controls listed in the options. Second, these units may present cross-media impacts such as effluent discharges if not properly operated and maintained, and spent carbon beds that have to be disposed of as hazardous waste. Thus, when making decisions about what controls to install on halogenated solvent cleaning machines to meet the requirements of this rule, all of these factors should be weighed and pollution prevention measures are encouraged wherever possible.

The EPA acknowledges that data show little additional benefit is achieved by the use of a working-mode cover in the presence of reduced room draft. Therefore, these controls are no longer included in the same control combination.

(5) Some changes have also been made to the compliance and reporting schedules. The initial notification report deadline for existing sources has been extended from 90 to 270 days after promulgation. This overrides the 120 day deadline in the final part 63 General Provisions. This was done to allow more time for the delegation of this rule to the States and to allow more time to process the reports from the large number of facilities affected by this rule. The initial statement of compliance report deadline for new and existing sources has been extended from 30 days to 150 days after the compliance date to allow time for owners or operators to determine compliance with the 3-month rolling average emission limit. The compliance time for existing sources has been extended from 2 to 3 years. This extension has been provided to allow sources the maximum flexibility in complying with these standards, including allowing time to consider alternative cleaning technologies. This change is consistent with the General Provisions (§ 63.6(b)(3)). The exceedance report schedule has been changed to include a biannual exceedance report if there is not an exceedance. This change is consistent with the General Provisions (§ 63.10(e)). Exceedance reports must still be submitted quarterly if there is an exceedance.

(6) Several commenters stated that the rule was complex and difficult to understand. They stated that additional guidance should be provided, particularly for small businesses. The EPA agrees that guidance would be helpful and has developed a brochure summarizing the rule, and will be developing a guidance manual that is scheduled for publication in January 1995. This guidance manual includes a detailed summary of the rule, example forms that can be used for reporting and recordkeeping, and additional assistance for evaluating alternative cleaning technologies.

(7) Several commenters recommended that the EPA reduce the monitoring frequency of the emission control equipment. The EPA evaluated the monitoring frequencies and has added a provision to the final rule that allows the hoist monitoring frequency to decrease from monthly to quarterly if, the owner or operator has operated the hoist for one year without an exceedance in the hoist speed. The EPA has also changed the reduced room draft (RRD) monitoring frequency from weekly to quarterly with weekly monitoring of the parameters used to obtain the RRD.

(8) Several comments were received on the batch cold cleaning machine equipment requirement provisions. A number of commenters reported the use of TCA, MC, and TCE in noncarburetor batch cold cleaning machine operations. The commenters stated that the proposed water layer control option was not always possible for these cleaning machines, particularly when TCA or TCE solvents are used. In order to address this issue, alternative control equipment options were added to the final rule to allow for the use of an increased freeboard ratio and cover, or remote-reservoir and cover, in lieu of a water layer and cover. An owner or

operator complying with these alternative options must also comply with work practice requirements. The final rule also allows an owner or operator of a batch cold cleaning machine to use alternative control equipment, if demonstrated to be equivalent to the equipment requirements cited in the final rule and approved by the Administrator.

IV. Administrative Requirements

A. Docket

The docket is an organized and complete file of all the information considered by the EPA in the development of this rulemaking. The docket is a dynamic file, since material is added throughout the rulemaking development. The docketing system is intended to allow members of the public and industries involved to readily identify and locate documents so that they can effectively participate in the rulemaking process. Along with the statement of basis and purpose of the proposed and promulgated standards and the EPA responses to significant comments, the contents of the docket will serve as the record in case of judicial review (section 307(d)(7)(A)).

B. Paperwork Reduction Act

Information collection requirements associated with this regulation (those included in 40 CFR Part 63, Subpart A and Subpart T) have been approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.* and have been assigned OMB control number (2060–0273). An Information Collection Request (ICR) document has been prepared by the EPA (ICR No. 1652.02) to reflect the changed information requirements of the final rule and has been submitted to OMB for review. A copy may be obtained from Sandy Farmer, Information Policy Branch, EPA 2136, 401 M St., SW, Washington, DC 20460, or by calling (202) 260–2740.

The annual respondent burden and costs averaged over the first 3 years for batch vapor and in-line cleaning machine subcategories are 359,000 hours and $12.0 million. Since the reporting burden for some of the required activities will be incurred only once, the average annual burden for batch vapor and in-line cleaning machine subcategories will decrease after the first two years of implementation. For the batch cold cleaning machine subcategory, the annual respondent burden and costs averaged over the first 3 years are 33,000 hours and $1.1 million. The batch cold cleaning machine subcategory is not expected to incur costs after the initial activities.

This collection of information is estimated to have an annual public reporting and recordkeeping burden averaging 42 hours per facility over the first 3 years. These burden estimates include time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Several commenters to the proposed rule in recognizing this burden noted that the rule was complex and difficult to understand, and suggested that additional guidance be provided, particularly for small businesses. To address these concerns the Emission Standards Division and the Small Business Assistance Program are developing a brochure to summarize this rule, and will be developing a guidance manual scheduled to be published in January 1995. This manual will include a detailed summary of the rule, example forms for reporting and recordkeeping, to alleviate at least in part the paperwork burden, and additional material for evaluating alternative cleaning technologies.

Send comments regarding the burden estimate or any other aspects of this collection of information, including suggestions for reducing this burden to Chief, Information Policy Branch (2/36), U.S. Environmental Protection Agency, 401 M St. SW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, DC 20503, marked "Attention: Desk Officer for the EPA."

C. Executive Order 12866

Under Executive Order 12866 (58 FR 51735 (October 4, 1993)) the Agency must determine whether the regulatory action is "significant" and therefore subject to OMB review and the requirements of the Executive Order. The Order defines "significant regulatory action" as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of the Executive Order, OMB has notified EPA that it considers this a "significant regulatory action" within the meaning of the Executive Order. The EPA has submitted this action to OMB for review. Changes made in response to OMB suggestions or recommendations will be documented in the public record.

D. Regulatory Flexibility Act

The Regulatory Flexibility Act (or RFA, Pub. L. 96–354, September 19, 1980) requires Federal agencies to give special consideration to the impact of regulation on small businesses. The RFA specifies that a final regulatory flexibility analysis must be prepared if a proposed regulation will have a significant economic impact on a substantial number of small entities. To determine whether a final RFA is required, a screening analysis, otherwise known as an initial RFA, is necessary.

Regulatory impacts are considered significant if:

(1) Annual compliance costs increase total costs of production by more than 5 percent; or

(2) Annual compliance costs as a percent of sales are at least 20 percent (percentage points) higher for small entities; or

(3) Capital cost of compliance represents a significant portion of capital available to small entities; or

(4) The requirements of the regulation are likely to result in closures of small entities. A "substantial number" of small entities is generally considered to be more than 20 percent of the small entities in the affected industry. Since the economic analysis deals only with small entities (in this case, facilities), it is also an initial RFA, and conclusions about the impacts on small entities can be drawn from what was done there already. Each of the criteria for significant impacts will be considered in turn.

The largest increase in total cost of production from increased emission control is 0.61 percent (SIC 359—Industrial Machinery, n.e.c.). This figure is well below the significant-impact threshold of five percent.

Assessing the differential impacts, measured by a comparison of compliance costs as a percent of sales for small and large entities, is more difficult as large model facilities were not analyzed in the economic impact analysis. Treatment of this small business impacts criterion involves creating two large model facilities.

It is assumed that large facilities use large solvent cleaning machines, then compliance costs for large cleaning machines are negative, and are thus savings. To be conservative, it is assumed here that large model facilities possess five very large solvent cleaning machines, so that a "maximum savings" case is modelled. This case is important as it models the maximum cost differential between large and small facilities.

Large model facilities were created for SICs 359 (Industrial Machinery, n.e.c.) and 254 (Partitions and Fixtures). SIC 359 was chosen because the small model facilities in this group experience the highest cost absorption impacts when compared with other small model facilities. SIC 254 was used because it had the smallest average per-facility revenue of facilities with greater than 100 employees. Thus, if they incur the same absolute savings as other large facilities, their relative percentage savings will be the highest, and they will experience the greatest cost savings in percentage terms as a result of the standard. The cost differentials are in no case larger than one percentage point. Thus, by this criterion, small business impacts are not deemed significant.

The third criterion focuses on the amount of capital available to small businesses or facilities. Since the capital costs incurred as a result of investment in control equipment needed for small businesses to meet the standard was less than 10 percent of the businesses' total assets in all 39 affected SIC codes, it was concluded that the total assets of small facilities will not be so adversely affected as to prohibit the procurement of outside financing. (Examining an increase in capital costs as a percentage of total assets is a measure of the ability of a firm or facility to meet this capital costs increase.) The conclusion, then, is that lack of available capital will not be an obstacle for small facilities in complying with the regulation.

Criterion number four stipulates that small business impacts are significant if compliance leads to closure. The only implication of closure in the economic impact analysis is found in the section on earnings impacts. Here it was found that, under worst-case assumptions, closures might occur in only two SIC codes, 254 and 259 (Miscellaneous Furniture and Fixtures), given their low rate of profitability in the baseline. If this indeed occurs, the question of whether or not these closures make up a substantial portion of small entities must be addressed. The actual number of impacted facilities in the 39 impacted SICs is unknown. If it can be assumed that each SIC is impacted in the same proportion, a proxy for the share of impacted facilities represented by SIC codes 254 and 259 is the total number of facilities in these SIC codes as a share of the total number of potentially impacted firms. SIC codes 254 and 259 hold a combined total 3,194 small facilities. This makes up 3.4 percent of the total 93,121 small facilities in all 39 SIC codes. Thus, in the extreme case that some closures result, the number of closures is estimated to be far less than the amount required to impact a substantial number of facilities.

In conclusion, and pursuant to section 605(b) of the Regulatory Flexibility Act, 5 U.S.C. 605(b), the Administrator certifies that this rule will not have a significant economic impact on a substantial number of small entities. The basis for the certification is that the economic impacts for small entities do not meet or exceed the four criteria in the Guidelines to the Regulatory Flexibility Act of 1980, as shown above. Further information on the initial RFA is available in the background information package (see *Background Information Document* section near the beginning of this preamble).

List of Subjects in 40 CFR Parts 9 and 63

Environmental Protection, Air pollution control, Hazardous substances, Halogenated solvent cleaning machines, Reporting and recordkeeping requirements.

Dated: November 15, 1994.

Carol M. Browner,

Administrator.

For the reasons set out in the preamble, title 40, chapter I, of the Code of Federal Regulations is amended as set forth below:

PART 9—[AMENDED]

1. The authority citation for part 9 continues to read as follows:

Authority: 7 U.S.C. 135 et seq., 135–136y; 15 U.S.C. 2001, 2003, 2005, 2006, 2601–2671; 21 U.S.C. 331j, 346a, 348; 31 U.S.C. 9701; 33 U.S.C. 1251 et seq., 1311, 1313d, 1314, 1321, 1326, 1330, 1344, 1345(d) and (e), 1361; E.O. 11735, 38 FR 21243, 3 CFR, 1971–1975 Comp. p. 973; 42 U.S.C. 241, 242b, 243, 246, 300f, 300g, 300g–1, 300g–2, 300g–3, 300g–4, 300g–5, 300g–6, 300j–1, 300j–2, 300j–3, 300j–4, 300j–9, 1857 et seq., 6901–6992k, 7401–7671q, 7542, 9601–9657, 11023, 11048.

2. Section 9.1 is amended by adding in numerical order a new entry to the table under the indicated heading to read as follows:

§ 9.1 OMB approvals under the Paperwork Reduction Act.

* * * * *

40 CFR citation	OMB control No.
* * * * *	
National Emission Standards for Hazardous Air Pollutants for Source Categories:	
* * * * *	
63.467–63.468	2060–0273
* * * * *	

PART 63—[AMENDED]

1. The authority citation for part 63 continues to read as follows:

Authority: 42 U.S.C. 7401 et seq.

2. Part 63 is amended by adding subpart T to read as follows:

Subpart T—National Emission Standards for Halogenated Solvent Cleaning

Secs.
63.460 Applicability and designation of source.
63.461 Definitions.
63.462 Batch cold cleaning machine standards.
63.463 Batch vapor and in-line cleaning machine standards.
63.464 Alternative standards.
63.465 Test methods.
63.466 Monitoring procedures.
63.467 Recordkeeping requirements.
63.468 Reporting requirements.
63.469 Equivalent methods of control.

Subpart T—National Emission Standards for Halogenated Solvent Cleaning

§ 63.460 Applicability and designation of source.

(a) The provisions of this subpart apply to each individual batch vapor, in-line vapor, in-line cold, and batch cold solvent cleaning machine that uses any solvent containing methylene chloride (CAS No. 75–09–2), perchloroethylene (CAS No. 127–18–4), trichloroethylene (CAS No. 79–01–6), 1,1,1-trichloroethane (CAS No. 71–55–6), carbon tetrachloride (CAS No. 56–23–5) or chloroform (CAS No. 67–66–3), or any combination of these halogenated HAP solvents, in a total concentration greater than 5 percent by weight, as a cleaning and/or drying agent. The concentration of these solvents may be determined using EPA test method 18, material safety data sheets, or engineering calculations.

(b) Except as noted in appendix C (General Provisions Applicability to Subpart T) of this subpart, the provisions of subpart A of this part (General Provisions) apply to owners or operators of any solvent cleaning machine meeting the applicability criteria of paragraph (a) of this section.

(c) Each solvent cleaning machine subject to this subpart that commences construction or reconstruction after November 29, 1993, shall achieve compliance with the provisions of this subpart immediately upon startup or by December 2, 1994, whichever is later.

"(d) Each solvent cleaning machine subject to this subpart that commenced construction or reconstruction on or before November 29, 1993, shall achieve compliance with the provisions of this subpart no later than.

(e) In delegating implementation and enforcement authority to a State under section 112(d) of the Act, the authority contained in paragraph (f) of this section shall be retained by the Administrator and not transferred to a State.

(f) The authority conferred in § 63.463(d)(9) and § 63.469 will not be delegated to any State.

§ 63.461 Definitions.

Unless defined below, all terms used in this subpart are used as defined in the 1990 Clean Air Act, or in subpart A of 40 CFR part 63:

Administrator means the Administrator of the United States Environmental Protection Agency or his or her authorized representative (e.g., State that has been delegated the authority to implement the provisions of this part.)

Air blanket means the layer of air inside the solvent cleaning machine freeboard located above the solvent/air interface. The centerline of the air blanket is equidistant between the sides of the machine.

Automated parts handling system means a mechanical device that carries all parts and parts baskets at a controlled speed from the initial loading of soiled or wet parts through the removal of the cleaned or dried parts. Automated parts handling systems include, but are not limited to, hoists and conveyors.

Batch cleaning machine means a solvent cleaning machine in which individual parts or a set of parts move through the entire cleaning cycle before new parts are introduced into the solvent cleaning machine. An open-top vapor cleaning machine is a type of batch cleaning machine. A solvent cleaning machine, such as a ferris wheel cleaner, that cleans multiple batch loads simultaneously and is manually loaded is a batch cleaning machine.

Carbon adsorber means a bed of activated carbon into which an air-solvent gas-vapor stream is routed and which adsorbs the solvent on the carbon.

Clean liquid solvent means fresh unused solvent, recycled solvent, or used solvent that has been cleaned of soils (e.g., skimmed of oils or sludge and strained of metal chips).

Cleaning capacity means, for a cleaning machine without a solvent/air interface, the maximum volume of parts that can be cleaned at one time. In most cases, the cleaning capacity is equal to the volume (length times width times height) of the cleaning chamber.

Cold cleaning machine means any device or piece of equipment that contains and/or uses liquid solvent, into which parts are placed to remove soils from the surfaces of the parts or to dry the parts. Cleaning machines that contain and use heated, nonboiling solvent to clean the parts are classified as cold cleaning machines.

Consumption means the amount of halogenated hazardous air pollutant solvent added to the solvent cleaning machine.

Cover means a lid, top, or portal cover that shields the solvent cleaning machine openings from air disturbances when in place and is designed to be easily opened and closed without disturbing the vapor zone. Air disturbances include, but are not limited to, lip exhausts, ventilation fans, and general room drafts. Types of covers include, but are not limited to, sliding, biparting, and rolltop covers.

Downtime mode means the time period when a solvent cleaning machine is not cleaning parts and the sump heating coils, if present, are turned off.

Dwell means the technique of holding parts within the freeboard area but above the vapor zone of the solvent cleaning machine. Dwell occurs after cleaning to allow solvent to drain from the parts or parts baskets back into the solvent cleaning machine.

Dwell time means the required minimum length of time that a part must dwell, as determined by § 63.465(d).

Emissions means halogenated hazardous air pollutant solvent consumed (i.e., halogenated hazardous air pollutant solvent added to the machine) minus the liquid halogenated hazardous air pollutant solvent removed from the machine and the halogenated hazardous air pollutant solvent removed from the machine in the solid waste.

Existing means any solvent cleaning machine the construction or reconstruction of which was commenced on or before November 29, 1993.

Freeboard area means; for a batch cleaning machine, the area within the solvent cleaning machine that extends from the solvent/air interface to the top of the solvent cleaning machine; for an in-line cleaning machine, it is the area within the solvent cleaning machine that extends from the solvent/air interface to the bottom of the entrance or exit opening, whichever is lower.

Freeboard height means; for a batch cleaning machine, the distance from the solvent/air interface, as measured during the idling mode, to the top of the cleaning machine; for an in-line cleaning machine, it is the distance from the solvent/air interface to the bottom of the entrance or exit opening, whichever is lower, as measured during the idling mode.

Freeboard ratio means the ratio of the solvent cleaning machine freeboard height to the smaller interior dimension (length, width, or diameter) of the solvent cleaning machine.

Freeboard refrigeration device (also called a chiller) means a set of secondary coils mounted in the freeboard area that carries a refrigerant or other chilled substance to provide a chilled air blanket above the solvent vapor. A primary condenser capable of meeting the requirements of § 63.463(e)(2)(i) is defined as both a freeboard refrigeration device and a primary condenser for the purposes of these standards.

Halogenated hazardous air pollutant solvent or halogenated HAP solvent means methylene chloride (CAS No. 75–09–2), perchloroethylene (CAS No. 127–18–4), trichloroethylene (CAS No. 79–01–6), 1,1,1-trichloroethane (CAS No. 71–55–6), carbon tetrachloride (CAS No. 56–23–5), and chloroform (CAS No. 67–66–3).

Hoist means a mechanical device that carries the parts basket and the parts to be cleaned from the loading area into the solvent cleaning machine and to the unloading area at a controlled speed. A hoist may be operated by controls or may be programmed to cycle parts through the cleaning cycle automatically.

Idling mode means the time period when a solvent cleaning machine is not actively cleaning parts and the sump heating coils, if present, are turned on.

Idling-mode cover means any cover or solvent cleaning machine design that allows the cover to shield the cleaning machine openings during the idling mode. A cover that meets this definition can also be used as a working-mode cover if that definition is also met.

Immersion cold cleaning machine means a cold cleaning machine in which the parts are immersed in the solvent when being cleaned. A remote reservoir cold cleaning machine that is also an immersion cold cleaning machine is considered an immersion cold cleaning machine for purposes of this subpart.

In-line cleaning machine or continuous cleaning machine means a solvent cleaning machine that uses an automated parts handling system, typically a conveyor, to automatically provide a continuous supply of parts to be cleaned. These units are fully enclosed except for the conveyor inlet and exit portals. In-line cleaning machines can be either cold or vapor cleaning machines.

Leak-proof coupling means a threaded or other type of coupling that prevents solvents from leaking while filling or draining solvent to and from the solvent cleaning machine.

Lip exhaust means a device installed at the top of the opening of a solvent cleaning machine that draws in air and solvent vapor from the freeboard area and ducts the air and vapor away from the solvent cleaning area.

Monthly reporting period means any calendar month in which the owner or operator of a solvent cleaning machine is required to calculate and report the solvent emissions from each solvent cleaning machine.

New means any solvent cleaning machine the construction or reconstruction of which is commenced after November 29, 1993.

Open-top vapor cleaning machine means a batch solvent cleaning machine that has its upper surface open to the air and boils solvent to create solvent vapor used to clean and/or dry parts.

Part means any object that is cleaned in a solvent cleaning machine. Parts include, but are not limited to, discrete parts, assemblies, sets of parts, and continuous parts (i.e., continuous sheets of metal).

Primary condenser means a series of circumferential cooling coils on a vapor cleaning machine through which a chilled substance is circulated or recirculated to provide continuous condensation of rising solvent vapors and, thereby, create a concentrated solvent vapor zone.

Reduced room draft means decreasing the flow or movement of air across the top of the freeboard area of the solvent cleaning machine to meet the specifications of § 63.463(e)(2)(ii). Methods of achieving a reduced room draft include, but are not limited to, redirecting fans and/or air vents to not blow across the cleaning machine, moving the cleaning machine to a corner where there is less room draft, and constructing a partial or complete enclosure around the cleaning machine.

Remote reservoir cold cleaning machine means any device in which liquid solvent is pumped to a sink-like work area that drains solvent back into an enclosed container while parts are being cleaned, allowing no solvent to pool in the work area.

Soils means contaminants that are removed from the parts being cleaned. Soils include, but are not limited to, grease, oils, waxes, metal chips, carbon deposits, fluxes, and tars.

Solvent/air interface means, for a vapor cleaning machine, the location of contact between the concentrated solvent vapor layer and the air. This location of contact is defined as the mid-line height of the primary condenser coils. For a cold cleaning machine, it is the location of contact between the liquid solvent and the air.

Solvent/air interface area means; for a vapor cleaning machine, the surface area of the solvent vapor zone that is exposed to the air; for an in-line cleaning machine, it is the total surface area of all the sumps; for a cold cleaning machine, it is the surface area of the liquid solvent that is exposed to the air.

Solvent cleaning machine means any device or piece of equipment that uses halogenated HAP solvent liquid or vapor to remove soils from the surfaces of materials. 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.

Solvent vapor zone means; for a vapor cleaning machine, the area that extends from the liquid solvent surface to the level that solvent vapor is condensed. This condensation level is defined as the midline height of the primary condenser coils.

Sump means the part of a solvent cleaning machine where the liquid solvent is located.

Sump heater coils means the heating system on a cleaning machine that uses steam, electricity, or hot water to heat or boil the liquid solvent.

Superheated vapor system means a system that heats the solvent vapor, either passively or actively, to a temperature above the solvent's boiling point. Parts are held in the superheated vapor before exiting the machine to evaporate the liquid solvent on them. Hot vapor recycle is an example of a superheated vapor system.

Vapor cleaning machine means a batch or in-line solvent cleaning machine that boils liquid solvent generating solvent vapor that is used as a part of the cleaning or drying cycle.

Water layer means a layer of water that floats above the denser solvent and provides control of solvent emissions. In many cases, the solvent used in batch cold cleaning machines is sold containing the appropriate amount of water to create a water cover.

Working mode means the time period when the solvent cleaning machine is actively cleaning parts. *Working-mode cover means anycover or solvent cleaning machine design that allows the cover to shield the cleaning machine openings from outside air disturbances while parts are being cleaned in the cleaning machine. A cover that is used during the working mode is opened only during parts entry and removal. A cover that meets this definition can also be used as an idling-mode cover if that definition is also met.*

§ 63.462 Batch cold cleaning machine standards.

(a) Each owner or operator of an immersion batch cold solvent cleaning machine shall comply with the requirements specified in paragraph(a)(1) or (a)(2) of this section.

(1) Employ a tightly fitting cover that shall be closed at all times except during parts entry and removal, and a water layer at a minimum thickness of 2.5 centimeters (1.0 inch) on the surface of the solvent within the cleaning machine, or

(2) Employ a tightly fitting cover that shall be closed at all times except during parts entry and removal and a freeboard ratio of 0.75 or greater.

(b) Each owner or operator of a remote-reservoir batch cold solvent cleaning machine shall employ a tightly fitting cover over the solvent sump that shall be closed at all times except during the cleaning of parts.

(c) Each owner or operator of a batch cold solvent cleaning machine complying with paragraphs (a)(2) or (b) of this section shall comply with the work and operational practice requirements specified in paragraphs (c)(1) through (c)(8) of this section.

(1) All waste solvent shall be collected and stored in closed containers. The closed container may contain a device that allows pressure relief, but does not allow liquid solvent to drain from the container.

(2) If a flexible hose or flushing device is used, flushing shall be performed only within the freeboard area of the solvent cleaning machine.

(3) The owner or operator shall drain solvent cleaned parts for 15 seconds or until dripping has stopped, whichever is longer. Parts having cavities or blind holes shall be tipped or rotated while draining.

(4) The owner or operator shall ensure that the solvent level does not exceed the fill line.

(5) Spills during solvent transfer shall be wiped up immediately. The wipe rags shall be stored in covered containers meeting the requirements of paragraph (c)(1) of this section.

(6) When an air- or pump-agitated solvent bath is used, the owner or operator shall ensure that the agitator is operated to produce a rolling motion of the solvent but not observable splashing against tank walls or parts being cleaned.

(7) The owner or operator shall ensure that, when the cover is open, the cold cleaning machine is not exposed to drafts greater than 40 meters per minute (132 feet per minute), as measured between 1 and 2 meters (3.3 and 6.6 feet) upwind and at the same elevation as the tank lip.

(8) Sponges, fabric, wood, and paper products shall not be cleaned.

(d) Each owner or operator of a batch cold cleaning machine shall submit an initial notification report as described in § 63.468(a) and a compliance report as described in § 63.468(b). No further reporting or recordkeeping is required.

§ 63.463 Batch vapor and in-line cleaning machine standards.

(a) Except as provided in § 63.464, each owner or operator of a solvent cleaning machine subject to the provisions of this subpart shall ensure that each existing or new batch vapor or in-line solvent cleaning machine subject to the provisions of this subpart conforms to the design requirements specified in paragraphs (a)(1) through (a)(7) of this section.

(1) Each cleaning machine shall be designed or operated to meet the control equipment or technique requirements in paragraph (a)(1)(i) or (a)(1)(ii) of this section.

(i) An idling and downtime mode cover, as described in § 63.463(d)(1)(i), that may be readily opened or closed, that completely covers the cleaning machine openings when in place, and is free of cracks, holes, and other defects.

(ii) A reduced room draft as described in § 63.463(e)(2)(ii).

(2) Each cleaning machine shall have a freeboard ratio of 0.75 or greater.

(3) Each cleaning machine shall have an automated parts handling system capable of moving parts or parts baskets at a speed of 3.4 meters per minute (11 feet per minute) or less from the initial loading of parts through removal of cleaned parts.

(4) Each vapor cleaning machine shall be equipped with a device that shuts off the sump heat if the sump liquid solvent level drops to the sump heater coils.

(5) Each vapor cleaning machine shall be equipped with a vapor level control device that shuts off sump heat if the vapor level in the vapor cleaning machine rises above the height of the primary condenser.

(6) Each vapor cleaning machine shall have a primary condenser.

(7) Each cleaning machine that uses a lip exhaust shall be designed and operated to route all collected solvent vapors through a properly operated and maintained carbon adsorber that meets the requirements of paragraph (e)(2)(vii) of this section.

(b) Except as provided in § 63.464, each owner or operator of an existing or new batch vapor cleaning machine shall comply with either paragraph (b)(1) or (b)(2) of this section.

(1) Each owner or operator of a batch vapor cleaning machine with a solvent/air interface area of 1.21 square meters (13 square feet) or less shall comply with the requirements specified in either paragraph (b)(1)(i) or (b)(1)(ii) of this section.

(i) Employ one of the control combinations listed in table 1 of this subpart or other equivalent methods of control as determined using the procedure in § 63.469, equivalent methods of control.

TABLE 1.—CONTROL COMBINATIONS FOR BATCH VAPOR SOLVENT CLEANING MACHINES WITH A SOLVENT/AIR INTERFACE AREA OF 1.21 SQUARE METERS (13 SQUARE FEET) OR LESS

Option	Control combinations
1	Working-mode cover, freeboard ratio of 1.0, superheated vapor.
2	Freeboard refrigeration device, superheated vapor.
3	Working-mode cover, freeboard refrigeration device.
4	Reduced room draft, freeboard ratio of 1.0, superheated vapor.
5	Freeboard refrigeration device, reduced room draft.
6	Freeboard refrigeration device, freeboard ratio of 1.0.
7	Freeboard refrigeration device, dwell.
8	Reduced room draft, dwell, freeboard ratio of 1.0.
9	Freeboard refrigeration device, carbon adsorber.
10	Freeboard ratio of 1.0, superheated vapor, carbon adsorber.

Note: Unlike most of the control techniques available for complying with this rule, carbon adsorbers are not considered to be a pollution prevention measure. Use of such units may impose additional cost and burden for a number of reasons. First, carbon adsorption units are generally more expensive than other controls listed in the options. Second, these units may present cross-media impacts such as effluent discharges if not properly operated and maintained, and spent carbon beds have to be disposed of as hazardous waste. When making decisions about what controls to install on halogenated solvent cleaning machines to meet the requirements of this rule, all of these factors should be weighed and pollution prevention measures are encouraged wherever possible.

(ii) Demonstrate that their solvent cleaning machine can achieve and maintain an idling emission limit of 0.22 kilograms per hour per square meter (0.045 pounds per hour per square foot) of solvent/air interface area as determined using the procedures in § 63.465(a) and appendix A to this part.

(2) Each owner or operator of a batch vapor cleaning machine with a solvent/air interface area greater than 1.21 square meters (13 square feet) shall comply with the requirements specified in either paragraph (b)(2)(i) or (b)(2)(ii) of this section.

(i) Employ one of the control combinations listed in table 2 of this subpart or other equivalent methods of control as determined using the procedure in § 63.469, equivalent methods of control.

TABLE 2.—CONTROL COMBINATIONS FOR BATCH VAPOR SOLVENT CLEANING MACHINES WITH A SOLVENT/AIR INTERFACE AREA GREATER THAN 1.21 SQUARE METERS (13 SQUARE FEET)

Option	Control combinations
1	Freeboard refrigeration device, freeboard ratio of 1.0, superheated vapor.
2	Dwell, freeboard refrigeration device, reduced room draft.
3	Working-mode cover, freeboard refrigeration device, superheated vapor.
4	Freeboard ratio of 1.0, reduced room draft, superheated vapor.

TABLE 2.—CONTROL COMBINATIONS FOR BATCH VAPOR SOLVENT CLEANING MACHINES WITH A SOLVENT/AIR INTERFACE AREA GREATER THAN 1.21 SQUARE METERS (13 SQUARE FEET)—Continued

Option	Control combinations
5	Freeboard refrigeration device, reduced room draft, superheated vapor.
6	Freeboard refrigeration device, reduced room draft, freeboard ratio of 1.0.
7	Freeboard refrigeration device, superheated vapor, carbon adsorber.

Note: Unlike most of the control techniques available for complying with this rule, carbon adsorbers are not considered to be a pollution prevention measure. Use of such units may impose additional cost and burden for a number of reasons. First, carbon adsorption units are generally more expensive than other controls listed in the options. Second, these units may present cross-media impacts such as effluent discharges if not properly operated and maintained, and spent carbon beds have to be disposed of as hazardous waste. When making decisions about what controls to install on halogenated solvent cleaning machines to meet the requirements of this rule, all of these factors should be weighed and pollution prevention measures are encouraged wherever possible.

(ii) Demonstrate that their solvent cleaning machine can achieve and maintain an idling emission limit of 0.22 kilograms per hour per square meter (0.045 pounds per hour per square foot) of solvent/air interface area as determined using the procedures in § 63.465(a) and appendix A of this part.

(c) Except as provided in § 63.464, each owner or operator of an in-line cleaning machine shall comply with paragraph (c)(1) or (c)(2) of this section as appropriate.

(1) Each owner or operator of an existing in-line cleaning machine shall comply with the requirements specified in either paragraph (c)(1)(i) or (c)(1)(ii) of this section.

(i) Employ one of the control combinations listed in table 3 of this subpart or other equivalent methods of control as determined using the procedure in § 63.469, equivalent methods of control.

TABLE 3.—CONTROL COMBINATIONS FOR EXISTING IN-LINE SOLVENT CLEANING MACHINES

Option	Control combinations
1	Superheated vapor, freeboard ratio of 1.0.
2	Freeboard refrigeration device, freeboard ratio of 1.0.
3	Dwell, freeboard refrigeration device.
4	Dwell, carbon adsorber.

Note: Unlike most of the control techniques available for complying with this rule, carbon adsorbers are not considered to be a pollution prevention measure. Use of such units may impose additional cost and burden for a number of reasons. First, carbon adsorption units are generally more expensive than other controls listed in the options. Second, these units may present cross-media impacts such as effluent discharges if not properly operated and maintained, and spent carbon beds have to be disposed of as hazardous waste. When making decisions about what controls to install on halogenated solvent cleaning machines to meet the requirements of this rule, all of these factors should be weighed and pollution prevention measures are encouraged wherever possible.

(ii) Demonstrate that their solvent cleaning machine can achieve and maintain an idling emission limit of 0.10 kilograms per hour per square meter (0.021 pounds per hour per square foot) of solvent/air interface area as determined using the procedures in § 63.465(a) and appendix A to this part.

(2) Each owner or operator of a new in-line cleaning machine shall comply with the requirements specified in either paragraph (c)(2)(i) or (c)(2)(ii) of this section.

(i) Employ one of the control combinations listed in table 4 of this subpart or other equivalent methods of control as determined using the procedure in § 63.469, equivalent methods of control section.

TABLE 4.—CONTROL COMBINATIONS FOR NEW IN-LINE SOLVENT CLEANING MACHINES

Option	Control combinations
1	Superheated vapor, freeboard refrigeration device.
2	Freeboard refrigeration device, carbon adsorber.
3	Superheated vapor, carbon adsorber.

Note: Unlike most of the control techniques available for complying with this rule, carbon adsorbers are not considered to be a pollution prevention measure. Use of such units may impose additional cost and burden for a number of reasons. First, carbon adsorption units are generally more expensive than other controls listed in the options. Second, these units may present cross-media impacts such as effluent discharges if not properly operated and maintained, and spent carbon beds have to be disposed of as hazardous waste. When making decisions about what controls to install on halogenated solvent cleaning machines to meet the requirements of this rule, all of these factors should be weighed and pollution prevention measures are encouraged wherever possible.

(ii) Demonstrate that their solvent cleaning machine can achieve and maintain an idling emission limit of 0.10 kilograms per hour per square meter (0.021 pounds per hour per square foot) of solvent/air interface area as determined using the procedures in § 63.465(a) and appendix A to this part.

(d) Except as provided in § 63.464, each owner or operator of an existing or new batch vapor or in-line solvent cleaning machine shall meet all of the following required work and operational practices specified in paragraph (d)(1) through (d)(12) of this section as applicable.

(1) Control air disturbances across the cleaning machine opening(s) by incorporating the control equipment or techniques in paragraph (d)(1)(i) or (d)(1)(ii) of this section.

(i) Cover(s) to each solvent cleaning machine shall be in place during the idling mode, and during the downtime mode unless either the solvent has been removed from the machine or maintenance or monitoring is being performed that requires the cover(s) to not be in place.

(ii) A reduced room draft as described in § 63.463(e)(2)(ii).

(2) The parts baskets or the parts being cleaned in an open-top batch vapor cleaning machine shall not occupy more than 50 percent of the solvent/air interface area unless the parts baskets or parts are introduced at a speed of 0.9 meters per minute (3 feet per minute) or less.

(3) Any spraying operations shall be done within the vapor zone or within a section of the solvent cleaning machine that is not directly exposed to the ambient air (i.e., a baffled or enclosed area of the solvent cleaning machine).

(4) Parts shall be oriented so that the solvent drains from them freely. Parts having cavities or blind holes shall be tipped or rotated before being removed from any solvent cleaning machine unless an equally effective approach has been approved by the Administrator.

(5) Parts baskets or parts shall not be removed from any solvent cleaning machine until dripping has stopped.

(6) During startup of each vapor cleaning machine, the primary condenser shall be turned on before the sump heater.

(7) During shutdown of each vapor cleaning machine, the sump heater shall be turned off and the solvent vapor layer allowed to collapse before the primary condenser is turned off.

(8) When solvent is added or drained from any solvent cleaning machine, the solvent shall be transferred using threaded or other leakproof couplings and the end of the pipe in the solvent sump shall be located beneath the liquid solvent surface.

(9) Each solvent cleaning machine and associated controls shall be maintained as recommended by the manufacturers of the equipment or using alternative maintenance practices that have been demonstrated to the Administrator's satisfaction to achieve the same or better results as those recommended by the manufacturer.

(10) Each operator of a solvent cleaning machine shall complete and pass the applicable sections of the test of solvent cleaning operating procedures in appendix B to this part if requested during an inspection by the Administrator.

(11) Waste solvent, still bottoms, and sump bottoms shall be collected and stored in closed containers. The closed containers may contain a device that would allow pressure relief, but would not allow liquid solvent to drain from the container.

(12) Sponges, fabric, wood, and paper products shall not be cleaned.

(e) Each owner or operator of a solvent cleaning machine complying with either paragraph (b) or (c) of this section shall comply with the requirements specified in paragraphs (e)(1) through (e)(4) of this section.

(1) Conduct monitoring of each control device used to comply with § 63.463 of this subpart as provided in § 63.466.

(2) Determine during each monitoring period whether each control device used to comply with these standards meets the requirements specified in paragraphs (e)(2)(i) through (e)(2)(vii) of this section.

(i) If a freeboard refrigeration device is used to comply with these standards, the owner or operator shall ensure that the chilled air blanket temperature (in °F or °C), measured at the center of the air blanket, is no greater than 30 percent of the solvent's boiling point.

(ii) If a reduced room draft is used to comply with these standards, the owner or operator shall comply with the requirements specified in paragraphs (e)(2)(ii)(A) and (e)(2)(ii)(B) of this section.

(A) Ensure that the flow or movement of air across the top of the freeboard area of the solvent cleaning machine or within the solvent cleaning machine enclosure does not exceed 15.2 meters per minute (50 feet per minute) at any time as measured using the procedures in § 63.466(d).

(B) Establish and maintain the operating conditions under which the wind speed was demonstrated to be 15.2 meters per minute (50 feet per minute) or less as described in § 63.466(d).

(iii) If a working-mode cover is used to comply with these standards, the owner or operator shall comply with the requirements specified in paragraphs (e)(2)(iii)(A) and (e)(2)(iii)(B) of this section.

(A) Ensure that the cover opens only for part entrance and removal and completely covers the cleaning machine openings when closed.

(B) Ensure that the working-mode cover is maintained free of cracks, holes, and other defects.

(iv) If an idling-mode cover is used to comply with these standards, the owner or operator shall comply with the requirements specified in paragraphs (e)(2)(iv)(A) and (e)(2)(iv)(B) of this section.

(A) Ensure that the cover is in place whenever parts are not in the solvent cleaning machine and completely covers the cleaning machine openings when in place.

(B) Ensure that the idling-mode cover is maintained free of cracks, holes, and other defects.

(v) If a dwell is used to comply with these standards, the owner or operator shall comply with the requirements specified in paragraphs (e)(2)(v)(A) and (e)(2)(v)(B) of this section.

(A) Determine the appropriate dwell time for each type of part or parts basket, or determine the maximum dwell time using the most complex part type or parts basket, as described in § 63.465(d).

(B) Ensure that, after cleaning, each part is held in the solvent cleaning machine freeboard area above the vapor zone for the dwell time determined for that particular part or parts basket, or for the maximum dwell time determined using the most complex part type or parts basket.

(vi) If a superheated vapor system is used to comply with these standards, the owner or operator shall comply with the requirements specified in paragraphs (e)(2)(vi)(A) through (e)(2)(vi)(C) of this section.

(A) Ensure that the temperature of the solvent vapor at the center of the superheated vapor zone is at least 10°F above the solvent's boiling point.

(B) Ensure that the manufacturer's specifications for determining the minimum proper dwell time within the superheated vapor system is followed.

(C) Ensure that parts remain within the superheated vapor for at least the minimum proper dwell time.

(vii) If a carbon adsorber in conjunction with a lip exhaust is used to comply with these standards, the owner or operator shall comply with the requirements specified in paragraphs (e)(2)(vii)(A) through (e)(2)(vii)(C) of this section.

(A) Ensure that the concentration of organic solvent in the exhaust from this device does not exceed 100 parts per million of any halogenated HAP compound as measured using the procedure in § 63.466(e). If the halogenated HAP solvent concentration in the carbon adsorber exhaust exceeds 100 parts per million, the owner or operator shall adjust the desorption schedule or replace the disposable canister, if not a regenerative system, so that the exhaust concentration of halogenated HAP solvent is brought below 100 parts per million.

(B) Ensure that the carbon adsorber bed is not bypassed during desorption.

(C) Ensure that the lip exhaust is located above the solvent cleaning machine cover so that the cover closes below the lip exhaust level.

(3) If any of the requirements of paragraph (e)(2) of this section are not met, determine whether an exceedance has occurred using the criteria in paragraphs (e)(3)(i) and (e)(3)(ii) of this section.

(i) An exceedance has occurred if the requirements of paragraphs (e)(2)(ii)(B), (e)(2)(iii)(A), (e)(2)(iv)(A), (e)(2)(v), (e)(2)(vi)(B), (e)(2)(vi)(C), (e)(2)(vii)(B), or (e)(2)(vii)(C) of this section have not been met.

(ii) An exceedance has occurred if the requirements of paragraphs (e)(2)(i), (e)(2)(ii)(A), (e)(2)(iii)(B), (e)(2)(iv)(B), (e)(2)(vi)(A), or (e)(2)(vii)(A) of this section have not been met and are not corrected within 15 days of detection. Adjustments or repairs shall be made to the solvent cleaning system or control device to reestablish required levels. The parameter must be remeasured immediately upon adjustment or repair and demonstrated to be within required limits.

(4) The owner or operator shall report all exceedances and all corrections and adjustments made to avoid an exceedance as specified in § 63.468(h).

(f) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the idling emission limit standards in paragraphs (b)(1)(ii), (b)(2)(ii), (c)(1)(ii), or (c)(2)(ii) of this section shall comply with the requirements specified in paragraphs (f)(1) through (f)(5) of this section.

(1) Conduct an initial performance test to comply with the requirements specified in paragraphs (f)(1)(i) and (f)(1)(ii) of this section.

(i) Demonstrate compliance with the applicable idling emission limit.

(ii) Establish parameters that will be monitored to demonstrate compliance. If a control device is used that is listed in paragraph (e)(2) of this section, then the requirements for that control device as listed in paragraph (e)(2) of this section shall be used unless the owner or operator can demonstrate to the Administrator's satisfaction that an alternative strategy is equally effective.

(2) Conduct the periodic monitoring of the parameters used to demonstrate compliance as described in § 63.466(f).

(3) Operate the solvent cleaning machine within parameters identified in the initial performance test.

(4) If any of the requirements in paragraphs (f)(1) through (f)(3) of this section are not met, determine whether an exceedance has occurred using the criteria in paragraphs (f)(4)(i) and (f)(4)(ii) of this section.

(i) If using a control listed in paragraph (e) of this section, the owner or operator shall comply with the appropriate parameter values in paragraph (e)(2) and the exceedance delineations in paragraphs (e)(3)(i) and (e)(3)(ii) of this section.

(ii) If using a control not listed in paragraph (e) of this section, the owner or operator shall indicate whether the exceedance of the parameters that are monitored to determine the proper functioning of this control would be classified as an immediate exceedance or whether a 15 day repair period would be allowed. This information must be submitted to the Administrator for approval.

(5) The owner or operator shall report all exceedances and all corrections and adjustments made to avoid an exceedance as specified in § 63.468(h).

§ 63.464 Alternative standards.

(a) As an alternative to meeting the requirements in § 63.463, each owner or operator of a batch vapor or in-line solvent cleaning machine can elect to comply with the requirements of § 63.464. An owner or operator of a solvent cleaning machine who elects to comply with § 63.464 shall comply with the requirements specified in either paragraph (a)(1) or (a)(2) of this section.

(1) If the cleaning machine has a solvent/air interface, as defined in § 63.461, the owner or operator shall comply with the requirements specified in paragraphs (a)(1)(i) and (a)(1)(ii) of this section.

(i) Maintain a log of solvent additions and deletions for each solvent cleaning machine.

(ii) Ensure that the emissions from each solvent cleaning machine are equal to or less than the applicable emission limit presented in table 5 of this subpart as determined using the procedures in § 63.465(b) and (c).

TABLE 5.—EMISSION LIMITS FOR BATCH VAPOR AND IN-LINE SOLVENT CLEANING MACHINES WITH A SOLVENT/AIR INTERFACE

Solvent cleaning machine	3-month rolling average monthly emission limit (kilograms/square meters/month)
Batch vapor solvent cleaning machines	150
Existing in-line solvent cleaning machines	153
New in-line solvent cleaning machines	99

(2) If the cleaning machine is a batch vapor cleaning machine and does not have a solvent/air interface, the owner or operator shall comply with the requirements specified in paragraphs (a)(2)(i) and (a)(2)(ii) of this section.

(i) Maintain a log of solvent additions and deletions for each solvent cleaning machine.

(ii) Ensure that the emissions from each solvent cleaning machine are equal to or less than the appropriate limits as described in paragraphs (a)(2)(ii)(A) and (a)(2)(ii)(B) of this section.

(A) For cleaning machines with a cleaning capacity, as reported in § 63.468(d), that is less than or equal to 2.95 cubic meters, the emission limit shall be determined using table 6 or equation 1. If using table 6, and the cleaning capacity of the cleaning machine falls between two cleaning capacity sizes, then the lower of the two emission limits applies.

(B) For cleaning machines with a cleaning capacity as reported in § 63.468(d), that is greater than 2.95 cubic meters, the emission limit shall be determined using equation 1.

$$EL = 330 * (Vol)^{0.6} \quad (1)$$

where:

EL = the 3-month rolling average monthly emission limit (kilograms/month).

TABLE 6.—EMISSION LIMITS FOR CLEANING MACHINES WITHOUT A SOLVENT/AIR INTERFACE

Cleaning capacity (cubic meters)	3-month rolling average monthly emission limit (kilograms/month)
0.00	0
0.05	55
0.10	83
0.15	106
0.20	126
0.25	144
0.30	160
0.35	176
0.40	190
0.45	204
0.50	218
0.55	231
0.60	243
0.65	255
0.70	266
0.75	278
0.80	289
0.85	299
0.90	310
0.95	320
1.00	330
1.05	340
1.10	349
1.15	359
1.20	368
1.25	377
1.30	386
1.35	395
1.40	404
1.45	412
1.50	421
1.55	429
1.60	438
1.65	446
1.70	454
1.75	462
1.80	470
1.85	477
1.90	485
1.95	493
2.00	500
2.05	508
2.10	515
2.15	522
2.20	530
2.25	537
2.30	544
2.35	551
2.40	558
2.45	565
2.50	572
2.55	579
2.60	585
2.65	592
2.70	599

TABLE 6.—EMISSION LIMITS FOR CLEANING MACHINES WITHOUT A SOLVENT/AIR INTERFACE—Continued

Cleaning capacity (cubic meters)	3-month rolling average monthly emission limit (kilograms/month)
2.75	605
2.80	612
2.85	619
2.90	625
2.95	632

Vol = the cleaning capacity of the solvent cleaning machine (cubic meters).

(b) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with § 63.464(a) shall demonstrate compliance with the applicable 3-month rolling average monthly emission limit on a monthly basis as described in § 63.465(b) and (c).

(c) If the applicable 3-month rolling average emission limit is not met, an exceedance has occurred. All exceedances shall be reported as required in § 63.468(h).

§ 63.465 Test methods.

(a) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with an idling emission limit standard in § 63.463(b)(1)(ii), (b)(2)(ii), (c)(1)(ii), or (c)(2)(ii) shall determine the idling emission rate of the solvent cleaning machine using Reference Method 307 in appendix A to this part.

(b) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with § 63.464 shall on the first operating day of every month ensure that the solvent cleaning machine system contains only clean liquid solvent. This includes, but is not limited to, fresh unused solvent, recycled solvent and used solvent that has been cleaned of soils. A fill line must be indicated during the first month the measurements are made. The solvent level within the machine must be returned to the same fill-line each month, immediately prior to calculating monthly emissions as specified in § 63.465(c). The solvent cleaning machine does not have to be emptied and filled with fresh unused solvent prior to the calculations.

(c) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with § 63.464 shall on the first operating day of the month comply with the requirements specified in paragraphs (c)(1) through (c)(3) of this section.

(1) Using the records of all solvent additions and deletions for the previous monthly reporting period required under § 63.464(a), determine solvent emissions (Ei) using equation 2 for cleaning machines with a solvent/air interface and equation 3 for cleaning machines without a solvent/air interface:

$$E_i = \frac{SA_i - LSR_i - SSR_i}{AREA_i} \qquad (2)$$

$$E_n = SA_i - LSR_i - SSR_i \qquad (3)$$

where:

E_i=the total halogenated HAP solvent emissions from the solvent cleaning machine during the most recent monthly reporting period i, (kilograms of solvent per square meter of solvent/air interface area per month).

E_n=the total halogenated HAP solvent emissions from the solvent cleaning machine during the most recent monthly reporting period i, (kilograms of solvent per month).

SA_i=the total amount of halogenated HAP liquid solvent added to the solvent cleaning machine during the most recent monthly reporting period i, (kilograms of solvent per month).

LSR_i=the total amount of halogenated HAP liquid solvent removed from the solvent cleaning machine during the most recent monthly reporting period i, (kilograms of solvent per month).

SSR_i=the total amount of halogenated HAP solvent removed from the solvent cleaning machine in solid waste, obtained as described in paragraph (c)(2) of this section, during the most recent monthly reporting period i, (kilograms of solvent per month).

$AREA_i$=the solvent/air interface area of the solvent cleaning machine (square meters).

(2) Determine SSR_i using the method specified in paragraph (c)(2)(i) or (c)(2)(ii) of this section.

(i) From tests conducted using EPA reference method 25d.

(ii) By engineering calculations included in the compliance report.

(3) Determine the monthly rolling average, EA, for the 3-month period ending with the most recent reporting period using equation 4 for cleaning machines with a solvent/air interface or equation 5 for cleaning machines without a solvent/air interface:

$$EA_i = \frac{\sum_{j=1}^{3} E_i}{3} \qquad (4)$$

$$EA_n = \frac{\sum_{j=1}^{3} E_n}{3} \qquad (5)$$

Where:

EA_i=the average halogenated HAP solvent emissions over the preceding 3 monthly reporting periods, (kilograms of solvent per square meter of solvent/air interface area per month).

EA_n=the average halogenated HAP solvent emissions over the preceding 3 monthly reporting periods (kilograms of solvent per month).

E_i=halogenated HAP solvent emissions for each month (j) for the most recent 3 monthly reporting periods (kilograms of solvent per square meter of solvent/air interface area).

E_n=halogenated HAP solvent emissions for each month (j) for the most recent 3 monthly reporting periods (kilograms of solvent per month).

j=1 = the most recent monthly reporting period.

j=2 = the monthly reporting period immediately prior to j=1.

j=3 = the monthly reporting period immediately prior to j=2.

(d) Each owner or operator of a batch vapor or in-line solvent cleaning machine using a dwell to comply with § 63.463 shall determine the appropriate dwell time for each part or parts basket using the procedure specified in paragraphs (d)(1) and (d)(2) of this section.

(1) Determine the amount of time for the part or parts basket to cease dripping once placed in the vapor zone. The part or parts basket used for this determination must be at room temperature before being placed in the vapor zone.

(2) The proper dwell time for parts to remain in the freeboard area above the vapor zone is no less than 35 percent of the time determined in paragraph (d)(1) of this section.

(e) An owner or operator of a source shall determine their potential to emit from all solvent cleaning operations, using the procedures described in paragraphs (e)(1) through (e)(3) of this section. A facility's total potential to emit is the sum of the HAP emissions from all solvent cleaning operations plus all HAP emissions from other sources within the facility.

(1) Determine the potential to emit for each individual solvent cleaning using equation 6.

$PTE_i=H_i \times W_i \times SAI_i$ (6)

Where:

PTE_i=the potential to emit for solvent cleaning machine i (kilograms of solvent per year).

H_i=hours of operation for solvent cleaning machine i (hours per year).

=8760 hours per year, unless otherwise restricted by a Federally enforceable requirement.

W_i=the working mode uncontrolled emission rate (kilograms per square meter per hour).

=1.95 kilograms per square meter per hour for batch vapor and cold cleaning machines.

=1.12 kilograms per square meter per hour for in-line cleaning machines.

SAI_i = solvent/air interface area of solvent cleaning machine i (square meters). Section 63.461 defines the solvent/air interface area for those machines that have a solvent/air interface. Cleaning machines that do not have a solvent/air interface shall calculate a solvent/air interface area using the procedure in paragraph (e)(2) of this section.

(2) Cleaning machines that do not have a solvent/air interface shall calculate a solvent/air interface area using equation 7.

$SAI=2.20 * (Vol)^{0.6}$ (7)

Where:

SAI=the solvent/air interface area (square meters).

Vol=the cleaning capacity of the solvent cleaning machine (cubic meters).

(3) Sum the PTE_i for all solvent cleaning operations to obtain the total potential to emit for solvent cleaning operations at the facility.

§ 63.466 Monitoring procedures.

(a) Except as provided in paragraph (g) of this section, each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the equipment standards in § 63.463 (b)(1)(i), (b)(2)(i), (c)(1)(i), or (c)(2)(i) shall conduct monitoring and record the results on a weekly basis for the control devices, as appropriate, specified in paragraphs (a)(1) and (a)(2) of this section.

(1) If a freeboard refrigeration device is used to comply with these standards, the owner or operator shall use a thermometer or thermocouple to measure the temperature at the center of the air blanket during the idling mode.

(2) If a superheated vapor system is used to comply with these standards, the owner or operator shall use a thermometer or thermocouple to measure the temperature at the center of the superheated solvent vapor zone while the solvent cleaning machine is in the idling mode.

(b) Except as provided in paragraph (g) of this section, each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the equipment standards of § 63.463 (b)(1)(i), (b)(2)(i), (c)(1)(i), or (c)(2)(i) shall conduct monitoring and record the results on a monthly basis for the control devices, as appropriate, specified in paragraphs (b)(1) and (b)(2) of this section.

(1) If a cover (working-mode, downtime-mode, and/or idling-mode cover) is used to comply with these standards, the owner or operator shall conduct a visual inspection to determine if the cover is opening and closing properly, completely covers the cleaning machine openings when closed, and is free of cracks, holes, and other defects.

(2) If a dwell is used, the owner or operator shall determine the actual dwell time by measuring the period of time that parts are held within the freeboard area of the solvent cleaning machine after cleaning.

(c) Except as provided in paragraph (g) of this section, each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the equipment or idling standards in § 63.463 shall monitor the hoist speed as described in paragraphs (c)(1) through (c)(4) of this section.

(1) The owner or operator shall determine the hoist speed by measuring the time it takes for the hoist to travel a measured distance. The speed is equal to the distance in meters divided by the time in minutes (meters per minute).

(2) The monitoring shall be conducted monthly. If after the first year, no exceedances of the hoist speed are measured, the owner or operator may begin monitoring the hoist speed quarterly.

(3) If an exceedance of the hoist speed occurs during quarterly monitoring, the monitoring frequency returns to monthly until another year of compliance without an exceedance is demonstrated.

(4) If an owner or operator can demonstrate to the Administrator's satisfaction in the initial compliance report that the hoist cannot exceed a speed of 3.4 meters per minute (11 feet per minute), the required monitoring frequency is quarterly, including during the first year of compliance.

(d) Except as provided in paragraph (g) of this section, each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the equipment standards in § 63.463 (b)(1)(i), (b)(2)(i), (c)(1)(i), or (c)(2)(i) using a reduced room draft shall conduct monitoring and record the results as specified in paragraph(d)(1) or (d)(2) of this section.

(1) If the reduced room draft is maintained by controlling room parameters (i.e., redirecting fans, closing doors and windows, etc.), the owner or operator shall conduct an initial monitoring test of the windspeed and of room parameters, quarterly monitoring of windspeed, and weekly monitoring of room parameters as specified in paragraphs (d)(1)(i) and (d)(1)(ii) of this section.

(i) Measure the windspeed within 6 inches above the top of the freeboard area of the solvent cleaning machine using the procedure specified in paragraphs (d)(1)(i)(A) through (d)(1)(i)(D) of this section.

(A) Determine the direction of the wind current by slowly rotating a velometer or similar device until the maximum speed is located.

(B) Orient a velometer in the direction of the wind current at each of the four corners of the machine.

(C) Record the reading for each corner.

(D) Average the values obtained at each corner and record the average wind speed.

(ii) Monitor on a weekly basis the room parameters established during the initial compliance test that are used to achieve the reduced room draft.

(2) If an enclosure (full or partial) is used to achieve a reduced room draft, the owner or operator shall conduct an initial monitoring test and, thereafter, monthly monitoring tests of the windspeed within the enclosure using the procedure specified in paragraphs (d)(2)(i) and (d)(2)(ii) of this section and a monthly visual inspection of the enclosure to determine if it is free of cracks, holes and other defects.

(i) Determine the direction of the wind current in the enclosure by slowly rotating a velometer inside the entrance to the enclosure until the maximum speed is located.

(ii) Record the maximum wind speed.

(e) Except as provided in paragraph (g) of this section, each owner or operator using a carbon adsorber to comply with this subpart shall measure and record the concentration of halogenated HAP solvent in the exhaust of the carbon adsorber weekly with a colorimetric detector tube. This test shall be conducted while the solvent cleaning machine is in the working mode and is venting to the carbon adsorber. The exhaust concentration shall be determined using the procedure specified in paragraphs (e)(1) through (e)(3) of this section.

(1) Use a colorimetric detector tube designed to measure a concentration of 100 parts per million by volume of solvent in air to an accuracy of ± 25 parts per million by volume.

(2) Use the colorimetric detector tube according to the manufacturer's instructions.

(3) Provide a sampling port for monitoring within the exhaust outlet of the carbon adsorber that is easily accessible and located at least 8 stack or duct diameters downstream from any flow disturbance such as a bend, expansion, contraction, or outlet; downstream from no other inlet; and 2 stack or duct diameters upstream from any flow disturbance such as a bend, expansion, contraction, inlet or outlet.

(f) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the idling emission limit standards of § 63.463 (b)(1)(ii), (b)(2)(ii), (c)(1)(ii), or (c)(2)(ii) shall comply with the requirements specified in paragraphs (f)(1) and (f)(2) of this section.

(1) If using controls listed in paragraphs (a) through (e) of this section, the owner or operator shall comply with the monitoring frequency requirements in paragraphs (a) through (e) of this section.

(2) If using controls not listed in paragraphs (a) through (e) of this section, the owner or operator shall establish the monitoring frequency for each control and submit it to the Administrator for approval in the initial test report.

(g) Each owner or operator using a control device listed in paragraphs (a) through (e) of this section can use alternative monitoring procedures approved by the Administrator.

§ 63.467 Recordkeeping requirements.

(a) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the provisions of § 63.463 shall maintain records in written or electronic form specified in paragraphs (a)(1) through (a)(5) of this section for the lifetime of the machine.

(1) Owner's manuals, or if not available, written maintenance and operating procedures, for the solvent cleaning machine and control equipment.

(2) The date of installation for the solvent cleaning machine and all of its control devices. If the exact date for installation is not known, a letter certifying that the cleaning machine and its control devices were installed prior to, or on, November 29, 1993, or after November 29, 1993, may be substituted.

(3) If a dwell is used to comply with these standards, records of the tests required in § 63.465(d) to determine an appropriate dwell time for each part or parts basket.

(4) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the idling emission limit standards of § 63.463(b)(1)(ii), (b)(2)(ii), (c)(1)(ii), or (c)(2)(ii) shall maintain records of the initial performance test, including the idling emission rate and values of the monitoring parameters measured during the test.

(5) Records of the halogenated HAP solvent content for each solvent used in a solvent cleaning machine subject to the provisions of this subpart.

(b) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with § 63.463 shall maintain records specified in paragraphs (b)(1) through (b)(4) of this section either in electronic or written form for a period of 5 years.

(1) The results of control device monitoring required under § 63.466.

(2) Information on the actions taken to comply with § 63.463(e) and (f). This information shall include records of written or verbal orders for replacement parts, a description of the repairs made, and additional monitoring conducted to demonstrate that monitored parameters have returned to accepted levels.

(3) Estimates of annual solvent consumption for each solvent cleaning machine.

(4) If a carbon adsorber is used to comply with these standards, records of the date and results of the weekly measurement of the halogenated HAP solvent concentration in the carbon adsorber exhaust required in § 63.466(e).

(c) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the provisions of § 63.464 shall maintain records specified in paragraphs (c)(1) through (c)(3) of this section either in electronic or written form for a period of 5 years.

(1) The dates and amounts of solvent that are added to the solvent cleaning machine.

(2) The solvent composition of wastes removed from cleaning machines as determined using the procedure described in § 63.465(c)(2).

(3) Calculation sheets showing how monthly emissions and the rolling 3-month average emissions from the solvent cleaning machine were determined, and the results of all calculations.

(d) Each owner or operator of a solvent cleaning machine without a solvent/air interface complying with the provisions of § 63.464 shall maintain records on the method used to determine the cleaning capacity of the cleaning machine.

§ 63.468 Reporting requirements.

(a) Each owner or operator of an existing solvent cleaning machine subject to the provisions of this subpart shall submit an initial notification report to the Administrator no later than August 29, 1995. This report shall include the information specified in paragraphs (a)(1) through (a)(6) of this section.

(1) The name and address of the owner or operator.

(2) The address (i.e., physical location) of the solvent cleaning machine(s).

(3) A brief description of each solvent cleaning machine including machine type (batch vapor, batch cold, vapor in-line or cold in-line), solvent/air interface area, and existing controls.

(4) The date of installation for each solvent cleaning machine or a letter certifying that the solvent cleaning machine and its control devices were installed prior to, or after, November 29, 1993.

(5) The anticipated compliance approach for each solvent cleaning machine.

(6) An estimate of annual halogenated HAP solvent consumption for each solvent cleaning machine.

(b) Each owner or operator of a new solvent cleaning machine subject to the provisions of this subpart shall submit an initial notification report to the Administrator. New sources for which construction or reconstruction had commenced and initial startup had not occurred before December 2, 1994, shall submit this report as soon as practicable before startup but no later than January 31, 1995. New sources for which the construction or reconstruction commenced after December 2, 1994, shall submit this report as soon as practicable before the construction or reconstruction is planned to commence. This report shall include all of the information required in § 63.5(d)(1) of subpart A (General Provisions), with the revisions and additions in paragraphs (b)(1) through (b)(3) of this section.

(1) The report shall include a brief description of each solvent cleaning machine including machine type (batch vapor, batch cold, vapor in-line, or cold-line), solvent/air interface area, and existing controls.

(2) The report shall include the anticipated compliance approach for each solvent cleaning machine.

(3) In lieu of § 63.5(d)(1)(ii)(H) of subpart A of this part, the owner or operator must report an estimate of

annual halogenated HAP solvent consumption for each solvent cleaning machine.

(c) Each owner or operator of a batch cold solvent cleaning machine subject to the provisions of this subpart shall submit a compliance report to the Administrator. For existing sources, this report shall be submitted to the Administrator no later than 150 days after the compliance date specified in § 63.460(d). For new sources, this report shall be submitted to the Administrator no later than 150 days after startup or May 1, 1995, whichever is later. This report shall include the requirements specified in paragraphs (c)(1) through (c)(4) of this section.

(1) The name and address of the owner or operator.

(2) The address (i.e., physical location) of the solvent cleaning machine(s).

(3) A statement, signed by the owner or operator of the solvent cleaning machine, stating that the solvent cleaning machine for which the report is being submitted is in compliance with the provisions of this subpart.

(4) The compliance approach for each solvent cleaning machine.

(d) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the provisions of § 63.463 shall submit to the Administrator an initial statement of compliance for each solvent cleaning machine. For existing sources, this report shall be submitted to the Administrator no later than 150 days after the compliance date specified in § 63.460(d). For new sources, this report shall be submitted to the Administrator no later than 150 days after startup or May 1, 1995, whichever is later. This statement shall include the requirements specified in paragraphs (d)(1) through (d)(6) of this section.

(1) The name and address of the owner or operator.

(2) The address (i.e., physical location) of the solvent cleaning machine(s).

(3) A list of the control equipment used to achieve compliance for each solvent cleaning machine.

(4) For each piece of control equipment required to be monitored, a list of the parameters that are monitored and the values of these parameters measured on or during the first month after the compliance date.

(5) Conditions to maintain the wind speed requirements of § 63.463(e)(2)(ii), if applicable.

(6) Each owner or operator of a solvent cleaning machine complying with the idling emission limit standards of § 63.463(b)(1)(ii), (b)(2)(ii), (c)(1)(ii), and (c)(2)(ii) shall submit a test report for tests of idling emissions meeting the specifications in Method 307 of appendix A to this subpart. This report shall comply with the requirements specified in paragraphs (d)(6)(i) through (d)(6)(iv) of this section.

(i) This test must be on the same specific model cleaner used at the source. The test can be done by the owner or operator of the affected machine or can be supplied by the vendor of that solvent cleaning machine or a third party.

(ii) This report must clearly state the monitoring parameters, monitoring frequency and the delineation of exceedances for each parameter.

(iii) If a solvent cleaning machine vendor or third party test report is used to demonstrate compliance, it shall include the following for the solvent cleaning machine tested: Name of person(s) or company that performed the test, model name, the date the solvent cleaning machine was tested, serial number, and a diagram of the solvent cleaning machine tested.

(iv) If a solvent cleaning machine vendor or third party test report is used, the owner or operator of the solvent cleaning machine shall comply with the requirements specified in either paragraphs (d)(6)(iv)(A) and (d)(6)(iv)(B) of this section.

(A) Submit a statement by the solvent cleaning machine vendor that the unit tested is the same as the unit the report is being submitted for.

(B) Demonstrate to the Administrator's satisfaction that the solvent emissions from the solvent cleaning machine for which the test report is being submitted are equal to or less than the solvent emissions from the solvent cleaning machine in the vendor test report.

(7) If a carbon adsorber is used to comply with these standards, the date and results of the weekly measurement of the halogenated HAP solvent concentration in the carbon adsorber exhaust required in § 63.466(e).

(e) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the provisions of § 63.464 shall submit to the Administrator an initial statement of compliance for each solvent cleaning machine. For existing sources, this report shall be submitted to the Administrator no later than 150 days after the compliance date specified in § 63.460(d). For new sources, this report shall be submitted to the Administrator no later than 150 days after startup or May 1, 1995, whichever is later. The statement shall include the information specified in paragraphs (e)(1) through (e)(4) of this section.

(1) The name and address of the solvent cleaning machine owner or operator.

(2) The address of the solvent cleaning machine(s).

(3) The solvent/air interface area for each solvent cleaning machine or, for cleaning machines without a solvent/air interface, a description of the method used to determine the cleaning capacity and the results.

(4) The results of the first 3-month average emissions calculation.

(f) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the provisions of § 63.463 shall submit an annual report by February 1 of the year following the one for which the reporting is being made. This report shall include the requirements specified in paragraphs (f)(1) through (f)(3) of this section.

(1) A signed statement from the facility owner or his designee stating that, "All operators of solvent cleaning machines have received training on the proper operation of solvent cleaning machines and their control devices sufficient to pass the test required in § 63.463(d)(10)."

(2) An estimate of solvent consumption for each solvent cleaning machine during the reporting period.

(3) The reports required under paragraphs (f) and (g) of this section can be combined into a single report for each facility.

(g) Each owner or operator of a batch vapor or in-line solvent cleaning machine complying with the provisions of § 63.464 shall submit a solvent emission report every year. This solvent emission report shall contain the requirements specified in paragraphs (g)(1) through (g)(4) of this section.

(1) The size and type of each unit subject to this subpart (solvent/air interface area or cleaning capacity).

(2) The average monthly solvent consumption for the solvent cleaning machine in kilograms per month.

(3) The 3-month monthly rolling average solvent emission estimates calculated each month using the method as described in § 63.465(c).

(4) The reports required under paragraphs (f) and (g) of this section can be combined into a single report for each facility.

(h) Each owner or operator of a batch vapor or in-line solvent cleaning machine shall submit an exceedance report to the Administrator semiannually except when, the Administrator determines on a case-by-case basis that more frequent reporting is necessary to accurately assess the compliance status of the source or, an exceedance occurs. Once an exceedance has occurred the owner or operator shall follow a quarterly reporting format until a request to reduce reporting frequency under paragraph (i) of this section is approved. Exceedance reports shall be delivered or postmarked by the 30th day following the end of each calendar half or quarter, as appropriate. The exceedance report shall include the applicable information in paragraphs (h)(1) through (3) of this section.

(1) Information on the actions taken to comply with § 63.463 (e) and (f). This information shall include records of written or verbal orders for replacement parts, a description of the repairs made, and additional monitoring conducted to demonstrate that monitored parameters have returned to accepted levels.

(2) If an exceedance has occurred, the reason for the exceedance and a description of the actions taken.

(3) If no exceedances of a parameter have occurred, or a piece of equipment has not been inoperative, out of control, repaired, or adjusted, such information shall be stated in the report.

(i) An owner or operator who is required to submit an exceedance report on a quarterly (or more frequent) basis may reduce the frequency of reporting to semiannual if the conditions in paragraphs (i)(1) through (i)(3) of this section are met.

(1) The source has demonstrated a full year of compliance without an exceedance.

(2) The owner or operator continues to comply with all relevant recordkeeping and monitoring requirements specified subpart A (General Provisions) and in this subpart.

(3) The Administrator does not object to a reduced frequency of reporting for the affected source as provided in paragraph (e)(3)(iii) of subpart A (General Provisions).

(j) The Administrator has determined, pursuant to the criteria under section 502(a) of the Act, that an owner or operator of any batch cold solvent cleaning machine that is not itself a major source and that is not located at a major source, as defined under 40 CFR 70.2, is exempt from part 70 permitting requirements for that source.

An owner or operator of any other solvent cleaning machine subject to the provisions of this subpart is subject to part 70 permitting requirements, such sources, if not major or located at major sources, may be exempted by the State from applying for a part 70 permit until 42 months after the EPA first approves a part 70 program or such other date established by the permitting authority that assures that such sources obtain a permit by 5 years after the EPA first approves a part 70 program.

(k) Each owner or operator of a solvent cleaning machine requesting an equivalency determination, as described in § 63.469 shall submit an equivalency request report to the Administrator. For existing sources, this report must be submitted to the Administrator no later than June 3, 1996. For new sources, this report must be submitted and approved by the Administrator prior to startup.

§ 63.469 Equivalent methods of control.

Upon written application, the Administrator may approve the use of equipment or procedures after they have been satisfactorily demonstrated to be equivalent, in terms of reducing emissions of methylene chloride, perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride or chloroform to the atmosphere, to those prescribed for compliance within a specified paragraph of this subpart. The application must contain a complete description of the equipment or procedure and the proposed equivalency testing procedure and the date, time, and location scheduled for the equivalency demonstration.

3. Appendix A is amended by adding Method 307 to read as follows:

Appendix A to Part 63—Test Methods

* * * * *

Method 307—Determination of Emissions From Halogenated Solvent Vapor Cleaning Machines Using a Liquid Level Procedure

1. Applicability and Principle

1.1 Applicability. This method is applicable to the determination of the halogenated solvent emissions from solvent vapor cleaners in the idling mode.

1.2 Principle. The solvent level in the solvent cleaning machine is measured using inclined liquid level indicators. The change in liquid level corresponds directly to the amount of solvent lost from the solvent cleaning machine.

2. Apparatus

Note: Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

2.1 Inclined Liquid Level Indicator. A schematic of the inclined liquid level indicators used in this method is shown in figure 307–1; two inclined liquid level indicators having 0.05 centimeters divisions or smaller shall be used. The liquid level indicators shall be made of glass, Teflon, or any similar material that will not react with the solvent being used. A 6-inch by 1-inch slope is recommended; however the slope may vary depending on the size and design of the solvent cleaning machine.

Note: It is important that the inclined liquid level indicators be constructed with ease of reading in mind. The inclined liquid level indicators should also be mounted so that they can be raised or lowered if necessary to suit the solvent cleaning machine size.

BILLING CODE 6560–50–P

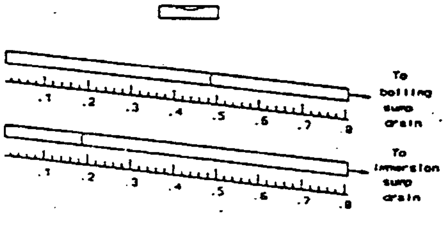

Figure 307–1 Inclined Liquid Level Indicator Apparatus.

BILLING CODE 6560–50–C

2.2 Horizontal Indicator. Device to check the inclined liquid level indicators orientation relative to horizontal.

2.3 Velocity Meter. Hotwire and vane anemometers, or other devices capable of measuring the flow rates ranging from 0 to 15.2 meters per minute across the solvent cleaning machine.

3. Procedure

3.1 Connection of the Inclined Liquid Level Indicator. Connect one of the inclined liquid level indicators to the boiling sump drain and the other inclined liquid level indicator to the immersion sump drain using Teflon tubing and the appropriate fittings. A schematic diagram is shown in figure 307–2.

BILLING CODE 6560–50–P

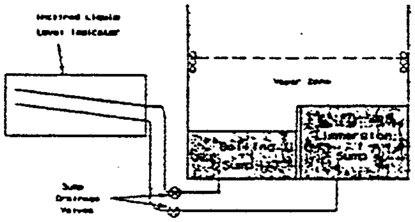

Figure 307-2. Solvent Cleaner Test Setup

BILLING CODE 5560-50-C

3.2 Positioning of Velocity Meter. Position the velocity meter so that it measures the flow rate of the air passing directly across the solvent cleaning machine.

3.3 Level the Inclined Liquid Level Indicators.

3.4 Initial Inclined Liquid Level Indicator Readings. Open the sump drainage valves. Allow the solvent cleaning machine to operate long enough for the vapor zone to form and the system to stabilize (check with manufacturer). Record the inclined liquid level indicators readings and the starting time on the data sheet. A sample data sheet is provided in figure 307-3.

Date ____________

Run ____________

Solvent type ____________

Solvent density, g/m^3 (lb/ft^3) ____________

Length of boiling sump (S_B), m (ft) ________

Width of boiling sump (W_B), m (ft) ________

Length of immersion sump (S_I), m (ft) ________

Width of immersion sump (W_I), m (ft) ________

Length of solvent vapor/air interface (S_V), m (ft) ________

Width of solvent vapor/air interface (W_V), m (ft) ________

Clock time	Boiling sump reading	Immersion sump reading	Flow rate reading

Figure 307-3. Data sheet.

3.5 Final Inclined Liquid Level Indicator Readings. At the end of the 16-hour test run, check to make sure the inclined liquid level indicators are level; if not, make the necessary adjustments. Record the final inclined liquid level indicators readings and time.

3.6 Determination of Solvent Vapor/Air Interface Area for Each Sump. Determine the area of the solvent/air interface of the individual sumps. Whenever possible, physically measure these dimensions, rather than using factory specifications. A schematic of the dimensions of a solvent cleaning machine is provided in figure 307-4.

BILLING CODE 6560-50-P

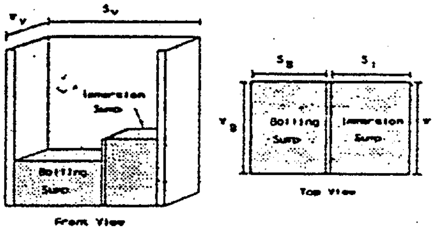

Figure 307-4. Solvent Cleaner Dimensions

BILLING CODE 6560-50-C

4. Calculations

4.1 Nomenclature.

A_B = area of boiling sump interface, m^2 (ft^2).

A_I = area of immersion sump interface, m^2 (ft^2).

A_V = area of solvent/air interface, m^2 (ft^2).

E = emission rate, kg/m^2-hr (lb/ft^2-hr).

K = 100,000 cm . g/m . kg for metric units.
= 12 in./ft for English units.

L_{Bf} = final boiling sump inclined liquid level indicators reading, cm (in.).

L_{Bi} = initial boiling sump inclined liquid level indicators reading, cm (in.).

L_{If} = final immersion sump inclined liquid level indicators reading, cm (in.).

L_{Ii} = initial immersion sump inclined liquid level indicators reading, cm (in.).

S_B = length of the boiling sump, m (ft).

S_I = length of the immersion sump, m (ft).

S_V = length of the solvent vapor/air interface, m (ft).

W_B = width of the boiling sump, m (ft).

W_I = width of the immersion sump, m (ft).

W_V = width of the solvent vapor/air interface, m (ft).

ρ = density of solvent, g/m3 (lb/ft3).

θ = test time, hr.

4.2 Area of Sump Interfaces. Calculate the areas of the boiling and immersion sump interfaces as follows:

$A_B = S_B W_B$ Eq. 307-1

$A_I = S_I W_I$ Eq. 307-2

4.3 Area of Solvent/Air Interface. Calculate the area of the solvent vapor/air interface as follows:

$A_V = S_V W_V$ Eq. 307-3

4.4 Emission Rate. Calculate the emission rate as follows:

$$E = \frac{\left(L_{B_f} - L_{B_i}\right)\rho A_B + \left(L_{I_f} - L_{I_i}\right)\rho A_I}{K A_V \theta}$$

Eq. 307-4

4. Appendix B to Part 63 is revised to read as follows:

Appendix B—Test of Solvent Cleaning Procedures

General Questions

______ 1. What is the maximum allowable speed for parts entry and removal?
A. 8.5 meters per minute (28 feet per minute).
B. 3.4 meters per minute (11 feet per minute).
C. 11 meters per minute (36 feet per minute).
D. No limit.

______ 2. How do you ensure that parts enter and exit the solvent cleaning machine at the speed required in the regulation?
A. Program on computerized hoist monitors speed.
B. Can judge the speed by looking at it.
C. Measure the time it takes the parts to travel a measured distance.

______ 3. Identify the sources of air disturbances.
A. Fans
B. Open doors
C. Open windows
D. Ventilation vents
E. All of the above

______ 4. What are the three operating modes?
A. Idling, working and downtime
B. Precleaning, cleaning, and drying
C. Startup, shutdown, off
D. None of the above

______ 5. When can parts or parts baskets be removed from the solvent cleaning machine?
A. When they are clean
B. At any time
C. When dripping stops
D. Either A or C is correct

______ 6. How must parts be oriented during cleaning?
A. It does not matter as long as they fit in the parts basket.
B. So that the solvent pools in the cavities where the dirt is concentrated.
C. So that solvent drains from them freely.

______ 7. During startup, what must be turned on first, the primary condenser or the sump heater?
A. Primary condenser
B. Sump heater
C. Turn both on at same time
D. Either A or B is correct

______ 8. During shutdown, what must be turned off first, the primary condenser or the sump heater?
A. Primary condenser
B. Sump heater
C. Turn both off at same time
D. Either A or B is correct

______ 9. In what manner must solvent be added to and removed from the solvent cleaning machine?
A. With leak proof couplings
B. With the end of the pipe in the solvent sump below the liquid solvent surface.
C. So long as the solvent does not spill, the method does not matter.
D. A and B

______ 10. What must be done with waste solvent and still and sump bottoms?
A. Pour down the drain
B. Store in closed container
C. Store in a bucket
D. A or B

______ 11. What types of materials are prohibited from being cleaned in solvent cleaning machines using halogenated HAP solvents?
A. Sponges
B. Fabrics
C. Paper
D. All of the above

Control Device Specific Questions

[ ] Freeboard Refrigeration Device

______ 1. What temperature must the FRD achieve?
A. Below room temperature
B. 50°F
C. Below the solvent boiling point
D. 30 percent below the solvent boiling point

[ ] Working-Mode Cover

______ 2. When can a cover be open?
A. While parts are in the cleaning machine
B. During parts entry and removal
C. During maintenance
D. During measurements for compliance purposes
E. A and C
F. B, C, and D

______ 3. Covers must be maintained in what condition?
A. Free of holes
B. Free of cracks
C. So that they completely seal cleaner opening
D. All of the above

[ ] Dwell

______ 4. Where must the parts be held for the appropriate dwell time?
A. In the vapor zone
B. In the freeboard area above the vapor zone
C. Above the cleaning machine
D. In the immersion sump

Answers

General Questions

1. B
2. A or C
3. E
4. A
5. C
6. C
7. A
8. B
9. D
10. B
11. D

Control Device Specific Questions

1. D
2. F
3. D
4. B

5. Appendix C is added to Part 63 to read as follows:

APPENDIX C—GENERAL PROVISIONS APPLICABILITY TO SUBPART T

Reference	Applies to subpart T		Comments
	BCC	BVI	
63.1(a) (1)–(3)	Yes	Yes.	
63.1(a)(4)	Yes	Yes	Subpart T (this appendix) specifies applicability of each paragraph in subpart A to subpart T.
63.1(a)(5)	No	No	
63.1(a) (6)–(8)	Yes	Yes	
63.1(a)(9)	No	No	
63.1(a)(10)	Yes	Yes	
63.1(a)(11)	No	No	Subpart T allows submittal of notifications and reports through the U.S. mail, fax, and courier. Subpart T requires that the postmark for notifications and reports submitted through the U.S. mail or other non-Governmental mail carriers be on or before deadline specified in an applicable requirement.
63.1(a) (12)–(14)	Yes	Yes	
63.1(b)(1)	No	No	Subpart T specifies applicability.
63.1(b)(2)	No	Yes	
63.1(b)(3)	No	No	Subpart T requires that a record of halogenated cleaning machine applicability determination be kept on site for 5 years, or until the cleaning machine changes its operations. The record shall be sufficiently detailed to allow the Administrator to make a finding about the source's applicability status with regard to subpart T.
63.1(c)(1)	Yes	Yes	

APPENDIX C—GENERAL PROVISIONS APPLICABILITY TO SUBPART T—Continued

Reference	Applies to subpart T		Comments
	BCC	BVI	
63.1(c)(2)	Yes	Yes	Subpart T, section 63.46(8)(h), indicates a Title V permit exemption for halogenated HAP batch cold solvent cleaning machines that are not major sources and not located at a major source. This section also specifies a deferral from the requirement of a Title V permit for owners or operators of solvent cleaning machines subject to subpart T provisions, other than halogenated HAP batch cold solvent cleaning machines, that are not major sources, and not located at a major source.
63.1(c)(3)	No	No	
63.1(c)(4)	Yes	Yes	
63.1(c)(5)	Yes	Yes	Subpart T does not require continuous monitoring systems (CMS) or continuous opacity monitoring systems. Therefore, notifications and requirements for CMS and COMS specified in subpart A do not apply to subpart T.
63.1(d)	No	No	
63.1(e)	No	Yes	
63.2	Yes	Yes	Subpart T definitions (section 63.461) for existing and new overlap with the definitions for existing source and new source in subpart A (section 63.2). Both subpart A and T also define Administrator.
63.3(a)–(c)	Yes	Yes	
63.4(a) (1)–(3)	Yes	Yes	
63.4(a)(4)	No	No	
63.4(a)(5)	Yes	Yes	
63.4(b)–(c)	Yes	Yes	
63.5(a)(1)	Yes	Yes	
63.5(a)(2)	Yes	Yes	
63.5(b)(1)	Yes	Yes	
63.5(b)(2)	No	No	
63.5(b)(3)	No	No	Subpart T overrides the requirement for approval prior to constructing a new or reconstructing an existing major source.
63.5(b)(4)–(6)	Yes	Yes	
63.5(c)	No	No	
63.5 (d)–(f)	No	No	Subpart T overrides the requirement to submit an application for approval of construction or reconstruction of a halogenated solvent cleaning machine.
63.6(a)	Yes	Yes	
63.6(b) (1)–(5)	Yes	Yes	Subpart T, section 63.460, specifies compliance dates.
63.6(b)(6)	No	No	
63.6(b)(7)	No	No	Subpart T has the same requirements for affected halogenated HAP solvent cleaning machine subcategories that are located at area sources as it does for those located at major sources.
63.6(c)(1)–(2)	Yes	Yes	Subpart T allows 3 years from the date of promulgation for both area and major existing sources to comply.
63.6(c) (3)–(4)	No	No	
63.6(c)(5)	Yes	Yes	Subpart T has the same requirements for affected halogenated HAP solvent cleaning machine subcategories that are located at area sources as it does for those located at major sources. Subpart T allows 3 years from the date of promulgation for both area and major existing sources to comply.
63.6(d)	No	No	
63.6(e)(1)–(2)	Yes	Yes	
63.6(e)(3)	No	No	Subpart T overrides the requirement of a startup, shutdown, and malfunction plan. Subpart T specifies startup and shutdown procedures to be followed by an owner or operator for batch vapor and in-line cleaning machines.
63.6(f)–(g)	Yes	Yes	
63.6(h)	No	No	Subpart T does not require compliance with an opacity or visible emission standard.
63.6(i) (1)–(14)	Yes	Yes	
63.6(i)(15)	No	No	
63.6(i)(16)	Yes	Yes	
63.6(j)	Yes	Yes	
63.7(a)	No	Yes	Subpart T gives owners or operators the option to perform an idling emission performance test as a way of demonstrating compliance. Other options are also available that do not require a performance test.
63.7(b)	No	Yes	This is only required for those owners or operators that choose the idling emission standard as their compliance option.
63.7(c)(1)	No	Yes	This is only required for those owners or operators that choose the idling emission standard as their compliance option.
63.7(c) (2)–(3)	No	No	Subpart T does not require a site-specific test plan for the idling emission performance test.
63.7(c)(4)	No	No	Subpart T does not require a performance test that involves the retrieval of gas samples, and therefore this does not apply.
63.7(d)	No	No	Requirements do not apply to the idling emission performance test option.
63.7(e)	No	Yes	
63.7(f)	No	Yes	

APPENDIX C—GENERAL PROVISIONS APPLICABILITY TO SUBPART T—Continued

Reference	Applies to subpart T		Comments
	BCC	BVI	
63.7(g)	No	Yes	Subpart T specifies what is required to demonstrate idling emission standard compliance through the use of the Environmental Protection Agency test method 307 and control device monitoring. Reports and records of testing and monitoring are required for compliance verification. Three runs of the test are required for compliance, as specified in section 63.7(e) of subpart A.
63.7(h)	No	No	Subpart T does not require the use of a performance test to comply with the standard. The idling emission standard option (which requires an idling emission performance test) is an alternative option offered to owners or operators of batch vapor and in-line cleaning machines for compliance flexibility.
63.8 (a)–(b)	Yes	Yes	
63.8 (c)–(e)	No	No	Subpart T does not require the use of continuous monitoring systems to demonstrate compliance.
63.8(f)	Yes	Yes	
63.8(g)	No	No	Subpart T does not require continuous opacity monitoring systems and continuous monitoring systems data.
63.9(a) (1)–(4)	Yes	Yes	
63.9(b)(1)	Yes	Yes	
63.9(b)(2)	Yes	Yes	Subpart T includes all of those requirements stated in subpart A, except that subpart A also requires a statement as to whether the affected source is a major or an area source, and an identification of the relevant standard (including the source's compliance date). Subpart T also has some more specific information requirements specific to the affected source (see subpart T, sections 63.468(a)–(b)).
63.9(b)(3)	Yes	Yes	The subpart A and subpart T initial notification reports differ (see above).
63.9(b)(4)	No	No	Subpart T does not require an application for approval of construction or reconstruction.
63.9(b)(5)	Yes	Yes	
63.9(c)	Yes	Yes	
63.9(d)	Yes	Yes	
63.9(e)	Yes	Yes	Under subpart T, this requirement only applies to owners or operators choosing to comply with the idling emissions standard.
63.9(f)	No	No	Subpart T does not require opacity or visible emission observations.
63.9(g)(1)	No	No	Subpart T does not require the use of continuous monitoring systems or continuous opacity monitoring systems.
63.9(h)	No	No	Section 63.468 of subpart T requires an initial statement of compliance for existing sources to be submitted to the Administrator no later than 150 days after the compliance date specified in section 63.460(d) of subpart T. For new sources, this report is to be submitted to the Administrator no later than 150 days from the date specified in section 63.460(c).
63.9(i)	Yes	Yes	
63.9(j)	Yes	Yes	
63.10(a)	Yes	Yes	
63.10(b)	No	No	Recordkeeping requirements are specified in subpart T.
63.10(c) (1)–(15)	No	No	Subpart T does not require continuous monitoring systems.
63.10(d)(1)	Yes	Yes	
63.10(d)(2)	No	No	Reporting requirements are specified in subpart T
63.10(e) (l)–(2)	No	No	Subpart T does not require continuous emissions monitoring systems.
63.10(e)(3)	No	No	Subpart T does not require continuous monitoring systems.
63.10(e)(4)	No	No	Subpart T does not require continuous opacity monitoring systems.
63.10(f)	Yes	Yes	
63.11(a)	Yes	Yes	
63.11(b)	No	No	Flares are not a control option under subpart T
63.12 (a)–(c)	Yes	Yes	
63.13 (a)–(c)	Yes	Yes	
63.14	No	No	Subpart T requirements do not require the use of the test methods incorporated by reference in subpart A.
63.15(a)–(b)	Yes	Yes	

BCC=Batch Cold Cleaning Machines.
BVI=Batch Vapor and In-line Cleaning Machines.

[FR Doc. 94–28974 Filed 12–01–94; 8:45 am]
BILLING CODE 6560–50–P

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40 CFR Part 70

[AD–FRL–5116–2]

Clean Air Act Final Interim Approval Operating Permits Programs in Oregon

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final interim approval

SUMMARY: EPA is promulgating interim approval of the operating permits programs submitted by the Oregon Department of Environmental Quality (ODEQ) and Lane Regional Air Pollution Authority (LRAPA) for the purpose of complying with Federal requirements for an approvable State program to issue operating permits to all major stationary sources, and to certain other sources.

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federal register

Friday
December 30, 1994

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Corrections

Federal Register
Vol. 59, No. 250
Friday, December 30, 1994

This section of the FEDERAL REGISTER contains editorial corrections of previously published Presidential, Rule, Proposed Rule, and Notice documents. These corrections are prepared by the Office of the Federal Register. Agency prepared corrections are issued as signed documents and appear in the appropriate document categories elsewhere in the issue.

DEPARTMENT OF DEFENSE

Office of the Secretary

Civilian Health and Medical Program of the Uniformed Services (CHAMPUS); FY95 DRG Updates; Correction

Correction

In notice document 94–28985 appearing on page 60613 in the issue of Friday, November 25, 1994, make the following correction:

On page 60613, in the third column, in the SUMMARY, in the second line and in the second paragraph, in the first line, "51994" should read "51944".

BILLING CODE 1505–01–D

DEPARTMENT OF DEFENSE

Department of the Army

Corps of Engineers

Intent to Prepare a Draft Environmental Impact Statement (DEIS) for Clean Water Act Section 404 Permit Application by Crandon Mining Company to Construct and Operate the Crandon Mine in Forest County, Wisconsin

Correction

In notice document 94–30820 appearing on page 64652, in the issue of Thursday, December 15, 1994, make the following corrections:

On page 64652, in the second column, under SUPPLEMENTARY INFORMATION:, in the second paragraph, in the ninth line, "Department" should read "Development".

On the same page, in the third column, under SUPPLEMENTARY INFORMATION:, in the first full paragraph, in the second line, "1966" should read "1996".

BILLING CODE 1505–01–D

DEPARTMENT OF ENERGY

Energy Information Administration

Agency Information Collection Under Review By the Office of Management and Budget

Correction

In notice document 94–29965 appearing on page 62721 in the issue of Tuesday, December 6, 1994, make the following corrections:

1. On page 62721, in the first column, under DATES, beginning in the first line, "within 30 days of publication of this notice." should read "on or before January 5, 1995.".

2. On the same page, in the second column, under SUPPLEMENTARY INFORMATION, in the first paragraph, 2. should read "FERC-525".

BILLING CODE 1505–01–D

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 63

[AD-FRL-5111-3]

RIN 2060-AC31

National Emission Standards for Hazardous Air Pollutants: Halogenated Solvent Cleaning

Correction

In rule document 94–28974 beginning on page 61801, in the issue of Friday, December 2, 1994, make the following correction:

§63.460 [Corrected]

On page 61806, in the first column, in §63.460 (d), in the sixth line, after the word "than" insert "December 2, 1997."

BILLING CODE 1505–01–D

DEPARTMENT OF THE INTERIOR

Bureau of Land Management

43 CFR Public Land Order 7087

[AK-932-4210-06; AA-58075]

Partial Revocation of Secretarial Order Dated January 22, 1940, as Modified; Alaska

Correction

In rule document 94–23403 beginning on page 48568 in the issue of Thursday, September 22, 1994, make the following correction:

On page 48568, in the third column, above the signature, insert "Dated: September 9, 1994."

BILLING CODE 1505–01–D

APPENDIX G

FACT SHEET

FINAL AIR TOXICS RULE FOR THE MAGNETIC TAPE MANUFACTURING INDUSTRY

November 22, 1994

FACT SHEET

FINAL AIR TOXICS RULE FOR MAGNETIC TAPE MANUFACTURING INDUSTRY

TODAY'S ACTION...

- The Environmental Protection Agency (EPA) is promulgating a rule to reduce air toxics emissions from the magnetic tape manufacturing industry. Air toxics are those air pollutants that are known or suspected of causing cancer or other serious health effects (e.g., reproductive effects or birth defects).

HEALTH AND ENVIRONMENTAL BENEFITS

- The rule would reduce emissions of air toxics by 2,300 tons per year (or 2,080 megagrams per year).
- Most of the air toxics emissions being controlled are also volatile organic compounds, key components in forming ground-level ozone, or smog. Therefore, the rule would also provide the additional benefit in helping reduce smog.

WHY MAGNETIC TAPE?

- Under the Clean Air Act Amendments of 1990, EPA is required to regulate emissions of 189 listed toxic air pollutants. On July 16, 1992, EPA published a list of source categories that emit one or more of these air toxics. For listed categories of "major" sources (those that emit 10 tons/yr or more of a listed pollutant or 25 tons or more of a combination of pollutants), the Act requires EPA to develop standards that will require the application of maximum achievable control technology (MACT).
- In its July 16, 1992, published list of industry groups (known as "source categories") to be regulated, EPA identified magnetic tape manufacturing operations as a major source of air toxics.

WHO WOULD BE AFFECTED BY THE RULE?

- Of the 25 plants that manufacture magnetic tape, 14 are estimated to be major sources of air toxics, and thus affected by the regulation.
- Types of products made by this industry include audio and video cassettes, and computer diskettes.
- The industry is geographically widespread across the country.

- The air toxic emissions are predominantly solvents used in the coating operation and cleaning of equipment. Some particulate air toxics emissions may occur from the transfer of the magnetic particles to the coating mix.

- Any coating line for which the production of magnetic tape is 1 percent or less of total production of the line in any 12-month period would not be affected by the rule.

WHAT DO THE STANDARDS REQUIRE?

- All new and existing magnetic tape facilities classified as major sources would be required to meet the following control requirements for the emission points as noted below.

  - For the majority of emission points, achieve 95 percent control of air toxics emitted from each source. Most plants are expected to meet this with a solvent recovery device, such as carbon adsorbers or condensers. Some may use incinerators. This requirement is for the following emission sources: solvent storage tanks, mix equipment, the coating operation, condenser vents in solvent recovery, and waste handling devices. The standards provide procedures for establishing an alternate concentration limit for the control device when the coating operations are not operating.

  - For emissions from the cleaning of removable parts, maintain a 75 percent freeboard ratio in wash sinks or reduce air toxics emissions by 88 percent. The freeboard ratio relates the amount of solvent in the wash sink to the sink size.

  - For the transfer of magnetic particles containing air toxics to the coating mix, use an enclosed particulate transfer device or a fabric filter.

  - For the flushing of lines to clean them, the rule requires it be done in a closed system or control emissions by 95 percent.

  - For wastewater, which is generated from the use of steam to desorb carbon adsorbers, a certain percent removal (specified by compound) of air toxics from the wastewater or an outlet concentration of 50 ppmw total regulated solvents. This could be achieved by steam strippers.

  - An alternate standard would allow the owner or operator to commit to more stringent control of the coating operations in lieu of controlling certain storage tanks.

  - Another alternative standard would allow the use of a low-toxics-content coating (no more than 0.18 kilograms of toxic solvents per liter of coating solids) instead of meeting the percent reduction control requirements for coating operations.

- Monitoring Requirements

  - The monitoring requirements vary depending on the emission source and the control used.

  - The requirements would be used to certify continuous compliance.

  - Continuous emission monitors for volatile organic compounds are required for regenerative carbon adsorbers.

  - For other controls, the monitoring is primarily parameters, the values of which are determined during the initial compliance test.

  - In certain situations, a material balance calculation on solvent recovery devices may be used to demonstrate continuous compliance.

- Limit on Usage of Air Toxics

  - The rule contains a mechanism for limiting the potential to emit air toxics from magnetic tape manufacturing via a limit on the usage of air toxics. An owner or operator might choose to use this mechanism in making the source non-major for air toxics, and thus not subject to the control requirements of the rule. Recordkeeping and reporting of air toxics usage would be required.

- Reporting/Recordkeeping

  - Records of compliance test data, monitoring results, and results from required tests for assuring quality information would be required to be maintained for at least 5 years.

  - Reports include an initial report of pertinent information about the emission sources, and periodic reports of the compliance status. The periodic reports would be semiannual unless an exceedance occurs; then, they would be quarterly.

<u>WHAT WOULD THE RULE COST?</u>

- The total annual cost of the rule for existing facilities is $800,000 per year; this cost includes an annualized capital cost, operation, monitoring, recordkeeping and reporting.

This results in a cost effectiveness of $350 per ton of air toxic emission reduction (or $390 per megagram reduction).

- The average percent price increase for all products in the magnetic media industry is estimated to be 0.03 percent. The EPA did not estimate price increases for the separate products.

FOR FURTHER INFORMATION

Anyone with a computer and a modem can download the rule from the Clean Air Act board of EPA's electronic TTN bulletin board. For further information about how to access the board, call (919) 541-5384. For further information about the rule, contact Gail Lacy on (919) 541-5261.

APPENDIX H

EXTRACTS FROM

ALTERNATIVES TO CHORINATED SOLVENTS IN CLEANING APPLICATIONS

A December 1994 Report Prepared By The
Institute For Research And Technical Assistance

SECTION 4:
CHEMICAL SUBSTITUTES

The heavy and increasingly stringent regulations on the chlorinated solvents has forced plants using the solvents in cleaning to evaluate alternative chemicals, processes and technologies. There has been particular urgency to finding alternatives to TCA and CFC-113 because of the imminent bans. Alternatives for these two solvents in cleaning applications can often serve as alternatives to the other chlorinated solvents as well. Many vendors are offering alternatives that they claim are "ozone safe." Users are bombarded by literature and visits from these vendors and equipment manufacturers seeking to profit from the ban. There are literally hundreds of different chemicals and formulations that can be used as alternatives to the chlorinated solvents in cleaning applications. Users often are unable to understand the differences in the myriad of products that are being offered and some users, before they select an alternative, evaluate hundreds of different cleaning formulations.

This product-by-product assessment is not productive and it is unnecessary since all of the chemical alternatives can be classified generically. The class in which a chemical fits determines its properties and its environmental effects. With a knowledge of a particular product's class, users can often decide whether the product would be effective in their operation, what kind of equipment would be necessary for use with the alternative and what regulations are in place now or might be in place in the future that would affect its use. Such a generic classification system can save evaluation time and resources and it can help users easily reject hundreds of formulations that distributors are marketing without unnecessary testing.

The first part of this section provides the framework that can be used to approach chemical substitution generically in cleaning applications. It lays out a systems analysis method that greatly simplifies the case-by-case testing and evaluation that is conducted today. It analyzes individual solvents available for cleaning and demonstrates the utility of the classification system. It then focuses on the cleaning systems that are used with the chemical alternatives.

The second part of this section discusses the methods by which the chemical alternatives can be implemented. It identifies and describes the equipment needs and the regulatory requirements for the alternative cleaning agents. The third part of this section identifies and describes a few other solvent options that do not fit well into the generic classes.

4.1 Generic Classification of Chemicals

Before embarking on the generic classification scheme, it is useful to discuss certain criteria before alternatives can be evaluated. These criteria are termed "rules of the game" and they provide generic guidelines for placing alternatives in a particular class so that their limitations can be understood and accommodated from the outset.

4.1.1 Rules of the Game As discussed in Section 2, some organic chemicals have short atmospheric lifetimes and others have long lifetimes. Those chemicals that have short atmospheric lifetimes break down readily in the lower atmosphere or troposphere. In doing so, they form so-called smog precursors. Thus chemicals that break down readily in the lower atmosphere cause smog and are regulated as volatile organic compounds (VOCs). As is apparent later, even some chemicals that are not especially volatile are classified as VOCs.

Other chemicals with long atmospheric lifetimes do not break down readily in the lower atmosphere. They are very stable and they survive for many years in the atmosphere. During that time, they make their way to the stratosphere or upper atmosphere. Once there, ultraviolet light decomposes them. If they contain chlorine or bromine, the chlorine or bromine will react with the ozone, depleting the protective ozone layer. Thus chemicals with long atmospheric lifetimes cause ozone depletion if they contain chlorine or bromine.

Halogens are a group of chemicals that include fluorine, chlorine and bromine. Chemicals that contain fluorine are very stable, which means they are likely to have reasonably long atmospheric lifetimes. Chemicals that contain fluorine -- which makes them very stable -- and chlorine or bromine will cause ozone depletion. If these chemicals contain hydrogen, they will be less stable and they will break down more readily in the lower atmosphere. They will contribute to ozone depletion but less so than chemicals containing no hydrogen.

Chemicals that contain fluorine but no chlorine or bromine do not deplete the ozone layer. Chemicals that contain any one of the halogens -- fluorine, chlorine or bromine -- contribute to global warming. The longer the atmospheric lifetime, the more the chemical causes global warming. Chemicals with one of the halogens and a hydrogen do cause global warming but less so than chemicals that contain no hydrogen. Again, the presence of the hydrogen renders the chemical less stable.

Chemicals containing one of the halogens, fluorine, chlorine or bromine, generally have no flash points. All organic chemicals that do not contain one of the halogens have flash points. Those with lower flash points are flammable and those with higher flash points are combustible.

Virtually all organic solvents with no halogens are VOCs. Some chemicals with chlorine or bromine are VOCs.

Chlorine imparts a chemical good cleaning capability whereas fluorine alone does not.

Adding hydrogen to a chemical containing chlorine or fluorine increases the chance that the chemical will be toxic.

4.1.2 Classes of Chemicals Once the rules of the game have been clearly defined, the generic chemical classes can be described. Most useful industrial or naturally occurring chemicals that might be used as solvents can be placed into one of these categories. The analysis begins with the chemical classes that have been used historically; these include flammable solvents, chlorinated solvents and CFC solvents. It then considers the classes that are emerging; these include the combustible solvents, HCFCs, HFCs, FCs, HBCs and FICs.

4.1.2.1 Flammable Solvents These solvents have flash points below about 100° F. Examples of flammable solvents include isopropyl alcohol (IPA), acetone, toluene, methyl ethyl ketone (MEK) and mineral spirits which are familiar and have been used for decades. These chemicals are low molecular weight organics with no halogens. Because they have low molecular weight, they have low flash points which means they present a worker danger. Again, because of their low molecular weight, they have high vapor pressure which indicates they are volatile and evaporate readily. As the rules of the game indicate, they break down readily in the atmosphere and so are classified as VOCs.

4.1.2.2 Chlorinated Solvents Examples of chlorinated solvents include carbon tetrachloride (CT), TCE, PERC, METH and TCA. These chemicals replaced the flammable solvents because they were perceived to be safer. Since they contain chlorine, according to the rules of the game, they do not have flash points. Like the flammable solvents, they have high vapor pressures and are volatile; they evaporate readily, leaving a clean, dry surface.

Some of the chlorinated solvents, like CT and TCA, have long atmospheric lifetimes and, because they contain chlorine, they cause ozone depletion. Others, like TCE, have short atmospheric lifetimes, and they are regulated as VOCs. PERC and METH have intermediate atmospheric lifetimes and they are not VOCs nor do they deplete the ozone layer. As mentioned in Section 2, PERC is currently regulated as a VOC but EPA has proposed exempting it.

4.1.2.3 CFCs Examples of CFCs that are liquids at room temperature and have been used as solvents include CFC-11 and CFC-113. These substances have long atmospheric lifetimes because they contain no hydrogen and they contribute to stratospheric ozone depletion because they contain chlorine. Their production will be banned on January 1, 1996 for that reason.

The CFCs are very low toxicity chemicals. Like the chlorinated solvents, they have high vapor pressures and evaporate readily. They have no flash points because they contain fluorine and chlorine.

4.1.2.4 Combustible Solvents These are high molecular weight organic solvents with flash points above about 100° F, in the combustible range; they are therefore less dangerous to workers than the flammable solvents. The flash points are higher but the vapor pressure is also lower than the flammable solvents. This is an advantage because combustible solvents are less volatile and emissions are lower; it is a disadvantage, however, because they do not evaporate readily. They require a water rinse or vacuum drying for complete removal; otherwise they leave a residue that requires an extremely long time to dry. Members of this class include certain terpenes, dibasic esters (DBE), N-methyl pyrrolidone (NMP), glycol ethers and alkyl acetates.

The combustible solvents do not contain chlorine so they do not cause ozone depletion. They do not contain chlorine or fluorine so they do not cause global warming. They have short atmospheric lifetimes and they are regulated as VOCs. These chemicals, because they are new, are relatively unscrutinized for their human health and environmental effects.

4.1.2.5 HCFCs The hydrochlorofluorocarbons or HCFCs contain chlorine and fluorine and they have fairly long atmospheric lifetimes so they cause ozone depletion and global warming. They are slated to be banned because of their ozone depletion potential. They are similar to CFCs except they contain hydrogen. The presence of the hydrogen causes them to break down more readily in the lower atmosphere and they have shorter atmospheric lifetimes than the CFCs. They therefore contribute less than the CFCs to global warming and ozone depletion. Nevertheless, because they do contribute to ozone depletion, they are slated to be banned sometime in the next century.

Three HCFCs -- HCFC-141b, HCFC-123 and HCFC-225 -- are liquids at room temperature and have been examined for solvent applications. Two of these HCFCs -- HCFC-123 and HCFC-225 -- have toxicity problems and one of them -- HCFC-141b -- has a higher ozone depletion potential than TCA. In the SNAP rule, described in Section 3, EPA has banned the use of HCFC-141b in solvent cleaning applications because of its high ozone depletion potential.

4.1.2.6 HFCs The hydrofluorocarbons or HFCs contain no chlorine so they do not cause ozone depletion. They do contain fluorine and they have fairly long atmospheric lifetimes so they contribute to global warming. Because they contain hydrogen, however, their contribution to global warming is less than that of the CFCs.

There are few HFCs being examined for use in solvent applications; most are gases at room temperature. The HFCs, because they contain no chlorine, are poor cleaners. They do form blends with other chemicals but the other chemicals they may be combined with would have limitations depending on the generic chemical class they fall into.

4.1.2.7 FCs or PFCs The fluorocarbons (FCs), also known as perfluorocarbons (PFCs), do not contain chlorine or bromine so they do not deplete the ozone layer. They contain fluorine but no hydrogen so they have extremely long atmospheric lifetimes. They are very strong global warming gases and are likely to be regulated in the future for this reason. EPA has limited their use in solvent cleaning applications under the SNAP rule because of their global warming capability.

The PFCs are very poor cleaners. One process being offered is a mixture of a PFC with a combustible solvent. The addition of the PFC suppresses the flammability of the combustible solvent. EPA is discouraging the use of this process because PFCs are such a strong Greenhouse gas.

4.1.2.8 BHCs Only one bromohydrocarbon (BHC) is being offered for use in solvent applications. Methylene bromide is extremely unstable and is combined with a terpene which acts as a stabilizer (see combustible solvents above). EPA indicates that methylene bromide's atmospheric lifetime is long enough for it to contribute to ozone depletion. Although the chronic toxicity of the chemical has not been examined, it appears to have high acute toxicity.

4.1.2.9 FICs The FICs or fluoroiodocarbons are an emerging class of chemical that is just beginning to be examined. These chemicals have no flash points because they contain halogens. One FIC, in particular, trifluoroiodomethane, is being examined as a potential cleaning agent. It is not clear whether the chemical is a VOC and toxicity testing has not been performed. One CFC manufacturer indicates that similar chemicals used as intermediates have proven to be extremely toxic.

4.1.3 Characteristics of Generic Chemical Classes Table 4-1 shows the generic chemical classes and certain of their characteristics. These characteristics are predicted based on the rules of the game. The flammable and combustible solvents which do not contain halogens all have flash points. The flammable solvents have high vapor pressures and evaporate readily; the table indicates they are volatile. The combustible solvents, because they have low vapor pressures, are not volatile. Flammable and combustible solvents are VOCs. They do not cause ozone depletion or global warming and they are generally good cleaners.

All other chemical classes listed in the table contain halogens so they have no flashpoints. They have high vapor pressures and are classified as volatile. Some of the chlorinated solvents are classified as VOCs. Members of the other classes have relatively long atmospheric lifetimes so they are not VOCs but they do contribute to ozone depletion. The long atmospheric lifetimes and the fact that they contain halogens also cause them to be greenhouse gases. The HFCs are poor cleaners and the PFCs, if used alone, have virtually no cleaning ability.

4.1.4 Characteristics of Alternative Cleaning Classes Table 4-2 lists some of the chlorinated solvents used in cleaning and some of the specific chemical alternatives that are being marketed as replacements. It provides a comparison of some of their physical, health and environmental characteristics. Appendix A also contains a table that specifies and compares certain characteristics of the chlorinated solvents and a number of specific alternatives.

The first column in Table 4-2 gives the PEL, the worker exposure level set by OSHA. As mentioned earlier, in general, the lower the PEL, the more acutely toxic is the chemical. An NE in Table 4-2 indicates that the chemical is relatively new to the market and OSHA has not yet established a PEL When a value is shown in parentheses, it indicates that OSHA has not yet set a PEL and the values given are those recommended by the manufacturer. The lowest PELs are for 2-butoxy

Table 4-1 Characteristics of Generic Chemical Classes

Classes	Examples[a]	Flash Point	Volatile	VOC	Ozone Depletion	Global Warming	Cleaning
Flammable Solvents	IPA, Acetone	Yes	Yes	Yes	No	No	Good
Combustible Solvents	Terpenes, DBE, NMP	Yes	No	Yes	No	No	Good
Chlorinated Solvents	CT,TCE, PERC,TCA	No	Yes	Some	Some	Some	Good
CFCs	CFC-11,CFC-113	No	Yes	No	Yes	Yes	Modest
HCFCs	HCFC-123, HCFC-141b,HCFC-225	No	Yes	No	Yes	Yes	Good
HFCs	HFC-43-10	No	Yes	No	No	Yes	Poor
FCs or PFCs	--	No	Yes	No	No	Yes	None
BHCs	Methylene bromide	No	Yes	No	Yes	Yes	Good
FICs	Fluoroiodomethane	No	Yes	NA	NA	NA	NA

NA is not available

[a] See text for full names of abbreviated names

Table 4-2 Technical and Environmental Characteristics of Potential Alternatives in Cleaning

Solvent	PEL (ppm)	VOC	HAP	Flash Point(°F)	Evap Rate[a]	Solvent Strength[b]	ODP	GWP	TOX[c]
TCE	50	Yes	Yes	No	6.39	VG	--	--	S
PERC	25(100)	Yes[d]	Yes	No	2.59	VG	--	--	S
METH	500	No	Yes	No	14.50	VG	--	--	S
TCA	350	No	Yes	No	6.00	VG	0.1	0.026	--
CFC-113	1000	No	No	No	21.00	M	0.8	1.4 --	
d-limonene	NE	Yes	No	117	(0.05)	VG	--	--	S
DBE	NE	Yes	No	212	0.009	VG	--	--	NT
NMP	NE	Yes	No	187	0.03	VG	--	--	R
2-butoxyethanol	25	Yes	Yes	140	0.072	VG	--	--	CN
Acetone	750	Yes	No	0	6.06	VG	--	--	IT
IPA	400	Yes	No	72	1.70	G	--	--	IT
HCFC-123	(10)	No	No	No	(25)	G	0.02	0.017	BT
HCFC-141b	(400)	No	No	No	(25)	G	0.15	0.087	--
HCFC-225	NA	No	No	No	(15)	M	0.01-0.04	0.04-0.06	IT
HFC-43-10	(400)	No	No	No	(18)	P	--	0.25	U
Methylene Bromide	NE	No	No	No	NA	G	0.17	NA	T

NE indicates that OSHA has not yet set a PEL for the chemical.
NA indicates the information is not available

[a] Relative to butyl acetate which has been assigned a value of 1. Author has estimated values where values appear in parentheses.

Source: Wolf, 1993/1994

[b] VG is very good; G is good; M is moderate; and P is poor.

[c] S is suspect carcinogen; NT is not tested; R is reproductive toxin; CN is central nervous system problems; IT is in testing; BT is benign tumors; U is unknown; and T is toxic.

[d] EPA has proposed exempting PERC from VOC regulations.

ethanol, PERC and HCFC-123. As discussed earlier, the PERC PEL may be lowered to 25 ppm in the future. The National Institute for Occupational Safety and Health (NIOSH), the research arm of OSHA, has recommended that the PEL of 2-butoxy ethanol be lowered further, to 5 ppm. The value for HCFC-123 was set at 30 because the chemical caused benign testicular and pancreatic tumors in rat toxicity studies.

The second column indicates whether the chemical is a VOC. METH, and the ozone depleting chemicals and the global warming chemicals (i.e. those with longer atmospheric lifetimes) are the only chemicals in the table that are not VOCs.

The third column indicates whether the chemical is listed as one of the 189 Hazardous Air Pollutants in the Clean Air Act Amendments of 1990. Only the chlorinated solvents and 2-butoxy ethanol are on the list. The other chemicals in the table are not listed, not because they are actually safer, but because they are relatively new chemicals that have not experienced widespread use. As they are more widely used, it is likely that some of these chemicals may be on a similar list in the future.

The fourth column provides the flash point for the chemical. Only the flammable and combustible solvents have flash points. The solvents that contain halogens do not, as dictated by the rules of the game.

The evaporation rate relative to butyl acetate, which has been assigned an evaporation rate of 1, is given in the fifth column. In some cases, the rate has been estimated and the values are shown in parentheses. The higher the evaporation rate, the higher the emissions will be during use. The chlorinated solvents -- TCE, PERC, METH and TCA -- all have high evaporation rates. CFC-113, the HCFCs and HFC-43-10 have even higher evaporation rates. The flammable solvents -- acetone and IPA -- also have high rates. In contrast, the combustible solvents -- d-limonene, DBE, NMP and 2-butoxy ethanol -- have lower evaporation rates, below 1. Losses of these solvents in bath cleaning operations will therefore be lower.

The sixth column provides a qualitative measure of the solvent strength. VG indicates a very good solvent; G indicates a good solvent; M indicates a moderate solvent; and P indicates a poor solvent. The chlorinated and combustible solvents listed in the table all are strong solvents. HFC-43-10 is a poor solvent.

The seventh column shows the ozone depletion potential (ODP) of the solvent. Again, as mentioned earlier, this is a measure of the ozone depletion capability of a chemical relative to the ozone depletion potential of CFC-11 which has a defined ODP of 1.0. TCA, the CFCs, the HCFCs and methylene bromide all have ODPs because they have relatively long atmospheric lifetimes and contain chlorine or bromine. As the rules of the game dictate, HFC-43-10 does not have an ODP because it does not contain chlorine or bromine.

HCFC-141b has an ODP that is higher than the ODP of TCA. Many users are substituting the HCFC for TCA. This is not good policy and, in fact, EPA is forbidding the use of the chemical in cleaning applications under the SNAP Program.

The eighth column lists the Global Warming Potential (GWP) of the chemicals. This is a measure of a substance's GWP relative to the GWP of CFC-11 which is defined as 1.0. Those chemicals with relatively long atmospheric lifetimes which contain any one of the halogens, fluorine, chlorine or bromine, are greenhouse gases as indicated by the rules of the game.

The ninth column provides a qualitative measure of the toxicity of the chemical. Three of the chlorinated solvents -- TCE, PERC and METH -- are suspect carcinogens, indicated by an S. D-limonene also has given a positive carcinogenicity test in male rats. In addition, EPA is concerned about the chemical's aquatic toxicity. DBE has caused eye problems at high concentrations and EPA has expressed an interest in having it tested for neurotoxicity but, to date, no chronic testing has been conducted; NT signifies not tested. NMP has been tested and is a reproductive toxin, signified by R. 2-Butoxy ethanol causes central nervous system effects and liver and kidney problems. EPA has required testing of both acetone and IPA and both chemicals are currently in testing (indicated by IT). HCFC-123 causes benign testicular and pancreatic tumors in rats (signified by BT). HCFC-225 is undergoing testing but it is known that one of the two isomers that makes up HCFC-225 is toxic. HFC-43-10 has unknown toxicity, indicated by U; initial toxicity results indicate that the chemical has reasonably low toxicity. Methylene bromide is expected to be more toxic than methylene chloride; this is indicated with a T. Trifluoroiodomethane has unknown toxicity.

4.1.5 Other Factors in Evaluating Alternative Chemical Classes Many of the alternatives listed in Table 4-2 are being marketed in place of TCA and CFC-113 because of the imminent bans. They are being marketed alone and in formulations with other chemicals under a variety of tradenames. Table 4-3 lists all of the solvents and provides their CAS number and the other chemical or common names by which some of them are known.

As discussed earlier, many users seeking alternatives are confused by the literature and claims made by vendors. Using the information provided here, Material Safety Data Sheets (MSDSs), and product literature can often be used to determine the identity and characteristics of the major ingredient in a formulation. For instance, the chemicals that are identified as HAPs in Table 3-3 often will be listed under the "hazardous ingredients" section of the Material Safety Data Sheet (MSDS) for solvent formulations containing the chemical. Those that are not listed are either thought to be less toxic (IPA and acetone), are relatively unscrutinized (the combustible solvents, HCFC-225, HCFC-43-10 and methylene bromide) or are too new to the market (HCFC-123 and HCFC-141b). In years to come, as more is known about them, they, too, may eventually be listed.

MSDSs containing "non-hazardous" chemicals will not list the chemicals under "hazardous ingredients." In some cases, the MSDS or the product literature will identify the chemical even if it is not required. The HCFCs, in some cases, are listed on the MSDS even though they are not required to be listed. In certain

Table 4-3 Identification Methods for Potential Alternatives In Cleaning

Solvent	CAS #	Other Names
TCE	79016	1,1,2-trichloroethylene trichloroethene
PERC	127184	tetrachloroethylene tetrachloroethene
METH	75092	dichloromethane
TCA	71556	methyl chloroform
CFC-113	76131	1,1,2-trichloro-1,2,2-trifluoroethane freon 113, FC-113
d-limonene	5989275	--
DBE[a]	1119400 627930 106650	Dimethyl Gluterate Dimethyl Adipate Dimethyl Succinate
NMP	872504	N-methyl-2-pyrrolidinone M-pyrol
2-butoxyethanol	111762	ethylene glycol butyl ether ethylene glycol monobutyl ether EGME butyl cellosolve
Acetone	67641	--
IPA	67630	propyl alcohol
HCFC-123	306832	1,1-dichloro-2,2,2-trifluoroethane dichlorotrifluoroethane
HCFC-141b	1717006	1,1-dichloro-1-fluorethane dichlorofluoroethane
HCFC-225[b]	NA	1,1-dichloro-2,2,3,3,3-pentafluoropropane (ca) 1,3-dichloro-1,1,2,2,3-pentafluoropropane (cb)
HFC-43-10	NA	1,1,1,2,3,4,4,5,5,5-decafluoropentane
Methylene bromide	NA	dibromomethane

[a] Combination of three dibasic esters
[b] Combination of HCFC-225 ca and HCFC-225cb
NA is not available

instances, other types of information can be used to identify the chemical. For example, if the literature indicates the formulation has a citrus odor, then d-limonene is probably present. If it indicates a pine odor, then it is likely to be a pine- rather than citrus-based terpene. These pine-derived terpenes are also classified as combustible solvents.

Products are being marketed that are mixtures of substances shown in Table 4-3. In some products, for instance, methylene bromide is combined with a terpene that apparently acts as a stabilizer. One MSDS for this product does not list the ingredients and, in fact, does not accurately list the decomposition products; it indicates that the products of decomposition are carbon dioxide and water when bromine gas or hydrogen bromide, which are very toxic, would be generated as well. In another case, a combination of a PFC and a combustible solvent is being marketed; since it is not required, these materials are not listed under "hazardous ingredients."

Many distributors of products containing flammable or combustible solvents claim their products are "ozone safe." This is self-evident, of course, since these materials contain no chlorine or bromine and have short atmospheric lifetimes. Indeed, their short atmospheric lifetime is the characteristic that makes them a VOC. Distributors of CFC-113, TCA and the HCFCs might very well make the claim that their chemicals are not VOCs. This claim is also self-evident.

Because of processing requirements, users may want to identify an alternative that will dry quickly without leaving a residue before it goes on to the next step in the production process. This would eliminate from consideration the combustible solvents because they have low evaporation rates. As discussed later, there are methods of removing or drying the combustible solvents more rapidly.

Users who need to remove a large amount of grease or oil would want an alternative that is a fairly strong solvent. Such users would not want to consider HFC or PFC alternatives as viable candidates since they are very poor solvents. In contrast, certain users might have a precision cleaning operation where sensitive parts require particulate removal. In such cases, the HFCs might make suitable cleaning agents.

4.2 Methods of Employing Chemical Alternatives

The equipment and methods of optimally employing the alternatives to chlorinated solvents have been the subject of intense work over the last several years. Because chlorinated solvents have been used so widely, the equipment for cleaning had been designed with their characteristics in mind. Now, with the impending bans of TCA and CFC-113, vendors had an incentive to examine alternatives and to devise equipment with which they could be used and methods by which their features could be optimized. For each alternative class, these are discussed below.

As described in Section 3, in California, the regulations are especially stringent. In some cases, firms will not be able to adopt some of the alternatives easily and others may not be able to adopt them at all. The regulatory requirements that accompany each of the alternatives are described here to provide guidance to users concerned with implementation. In many cases, the regulatory constraints may be prohibitive and the user should consider other alternatives that can be more readily implemented.

4.2.1 Flammable Solvents There are two definitions of "flammable." One of these, a chemical that has a flash point of 100° F or below, is used by local fire departments. Another, a chemical that has a flash point of 140° F or below, is used in RCRA to define ignitable hazardous waste. The former definition of the term will be used here.

Flammable solvents cannot be used alone in vapor degreasers. Ignition or combustion occurs if fuel (in this case, the flammable solvent) is heated in the presence of oxygen. The boiling point of the solvents -- which must be achieved in a vapor degreaser -- is higher than the flash point. They would spontaneously ignite before the boiling point was reached. For this reason, it is dangerous to heat the solvents at all. In this light, flammable solvents are almost always used at room temperature, either in small baths, remote reservoir cleaners or in handwipe applications.

Commonly used flammable solvents include IPA, methanol, acetone, MEK and mineral spirits. Fire departments have strict regulations on the storage and use of these solvents and they generally forbid the use of large baths of the solvents without certain safety features. In some cases, equipment manufacturers introduce nitrogen, an inert gas, into the closed cleaning system. The nitrogen displaces oxygen and ignition, because no oxygen is present, is no longer possible. Such equipment is then referred to as "inerted."

IPA, methanol and acetone are often used in small containers for dipping parts. Acetone, because it contains a ketone group, is a stronger cleaner than either of the alcohols. It is more effective in removing resin-like contaminants. IPA, because it has a lower vapor pressure than acetone, takes longer to evaporate but it still evaporates quite readily. Chlorinated solvents are used today in cold cleaning bath applications. In some applications, the flammable solvents may be technically suitable alternatives. For instance, acetone has solvency similar to that of METH and it might be a viable technical alternative. As discussed in Section 2, however, air district regulations may not allow the substitution depending on the application.

TCA and CFC-113 are the chlorinated solvents most often used in so-called handwipe applications today. The other chlorinated solvents, because of their low PELs, are more dangerous for workers. Of the flammable solvents, IPA, acetone and MEK are commonly used in handwipe applications. Small containers of the solvents are used with rags or cotton swabs to do touch-up work on parts. In some cases, the solvents are used to wipe down large or small parts prior to coating or adhesive application. In other cases, they are used to clean coating or adhesive application equipment. IPA is also often used to rework printed circuit boards. Again, the flammable solvents, with some compromises, are likely to be suitable technical alternatives in handwipe applications. As discussed in Section 2, however, the stringent regulations on the flammable solvents because they are high vapor pressure VOCs make them difficult to use.

Mineral spirits are most often used in remote reservoir cleaning units for heavily oiled parts. The units are constructed with a sink, a drain and an application wand. The solvent is applied to the part and the excess solvent and oil fall into the sink and enter the drain, which is connected to a drum of waste solvent. Natural gravity separation allows the contaminants to separate from the solvent and travel to the top of the bath. The cleaner solvent is continuously pumped from the bottom of the tank until the entire solution is "spent" or too contaminated for further use. The waste solvent is picked up and recycled on a periodic (monthly or quarterly) basis. In certain cases where chlorinated solvents are currently used to remove heavy oil from parts, mineral spirits may be a viable technical alternative.

In electronics, TCA and CFC-113 are commonly used, in combination with a small amount of alcohol, to remove flux from printed circuit (PC) boards. One alternative option being offered by vendors is to use pure IPA for this use. In general, the boards require spraying to ensure that the flux is adequately removed from under the components so a later failure will not occur. Again, as mentioned earlier, using a flammable solvent like alcohol in a spray system is very dangerous and the equipment must be inerted and should be placed in a remote location. Another option is to use terpenes in conjunction with a water rinse. The equipment for use with terpenes is also inerted for safety reasons. Terpene cleaning is discussed in more detail under the section on combustible solvents below.

The flammable solvents are all classified as VOCs. In one case, a petition has been submitted to EPA to exempt acetone from VOC regulations. In testing and atmospheric modeling, results suggest that acetone is no more reactive than ethane which is the cutoff EPA uses for classifying chemicals as VOCs. EPA plans to publish a proposal to exempt acetone in June, 1994 in the Federal Register. If the chemical is exempted by EPA, it must also be exempted by each individual air district in California.

Several issues arise in the regulatory arena when a firm attempts to convert from a chlorinated solvent to a flammable solvent. As described in Section 3, in a California air district, a firm will have to go through New Source Review (NSR) to effect the conversion. In most cases, NSR requires that VOCs be used in conjunction with Best Available Control Technology (BACT) and that emissions offsets be provided. Most air districts specify controls for cold cleaning equipment that must be met to satisfy BACT requirements. In handwipe applications, some air districts do not permit the operations (e.g. SCAQMD) and some grant permits for whole facilities that include handwipe operations (e.g. Ventura APCD).

In many cases where a facility is converting from an exempt chemical like TCA, CFC-113 or METH to a VOC, there will be emissions offset requirements. That is, the increase in VOC use may have to be offset by an equal or a larger decrease in VOC use. This offset may come from another process within the facility or it may be purchased from a second party interested in selling excess emissions. As discussed in Section 3, most local air districts have rules that specify equipment standards and the VOC content of the solvents that are allowed in operations. Depending on the location of the facility, a particular alternative may not meet the rule requirements.

Conversion to flammable solvents will also have to be approved by local fire department officials. Storage and usage requirements will have to be met. In some cases, nitrogen inerting or isolation may be necessary to protect workers adequately.

The flammable solvents, because they have flash points below 100° F, must be disposed of as hazardous waste. In handwipe applications, since these solvents are generally listed materials under RCRA (F001 or F002), the rags and cotton swabs must also be handled as hazardous waste.

4.2.2 Combustible Solvents The combustible solvents, as defined here, have flash points above 100° F. These solvents are generally fairly new to the market and have not been used widely. Historically, there was no need for them because users generally employed either the chlorinated or the flammable solvents which have more desirable technical characteristics. The combustible solvents have lower vapor pressure than the chlorinated or flammable solvents. This is an advantage in that emissions of the solvents are lower than emissions of chlorinated or flammable solvents. The lower evaporation rate can be a technical disadvantage, however, when a part needs to be completely dry to move on to the next operation immediately.

Combustible solvents that are currently being offered include dibasic esters, N-methyl pyrrolidone, certain terpenes, alkyl acetates, various mineral spirits and combinations of these materials. All of these solvents are classified as VOCs. They are often touted by the vendors as being "largely non-VOCs." This is a meaningless categorization. What is really meant is that the solvents have lower vapor pressures and they evaporate less readily. In certain applications, their emissions would be lower than the flammable or chlorinated solvents. Nevertheless, they are 100 percent VOCs.

These solvents are technically suitable alternatives to chlorinated solvents in cold cleaning bath applications. In some cases they are used alone and the part is dipped in the tank and the contaminants are removed by the combustible solvent. If the part is required to be dry immediately, the combustible solvents may not be a technically suitable alternative since they take much longer to evaporate. Methods of removing the solvents more rapidly are available. They include rinsing the part with water to displace the combustible solvent or using an air or vacuum dryer to dry the solvent from the part.

Combustible solvents are also technically suitable as alternatives to chlorinated solvents currently used for vapor degreasing. Currently, When chlorinated solvents are used, the parts emerge from the degreaser clean and dry. Combustible solvents cannot be boiled because the flash point is lower than the boiling point; like flammable solvents, these solvents would self-ignite before the boiling point was reached. The combustible solvents generally leave a residue on the part because of their low evaporation rate.

A new cleaning system -- called semi-aqueous cleaning -- has been devised to minimize the disadvantages of the combustible solvents. It involves heating a bath of the combustible solvent somewhat, but well below the flash point. The part is immersed in the bath or sprayed with the pure solvent to remove the contaminants. The part is then passed through an air knife to remove some of the solvent. It goes on to the next bath which is an emulsion of the solvent and water. The part is then rinsed in one or more baths of water to remove the combustible solvent from the part. Finally, water is dried from the part in a forced air or infrared dryer.

PC board defluxing, which is currently performed with TCA and CFC-113, can utilize the semi-aqueous process. The first bath, in this case, generally includes a high pressure spray of the solvents. Because they are combustible, the solvents are subject to spontaneous explosion if an ignition source is present. To avoid this problem, the equipment has been designed to include nitrogen inerting systems.

Another method of using the combustible solvents in place of the chlorinated solvents in vapor degreasing is to use them alone without the water. The part is dipped in a heated bath or sprayed and then vacuum dried to remove the residue of the solvent.

In handwipe operations, the combustible solvents pose some technical problems. Because of the low evaporation rate of the solvents, they will leave a residue in remote reservoir or wipe cleaning. For some parts this may not matter; for example, some cuts of mineral spirits are combustible solvents and they are used in repair and maintenance cleaning to remove gross oil. It is not necessary to have a residue-free part. In other cases, where the substrate is being prepared for coating or adhesive application, the part must be residue-free. In these cases, a second wipe operation, either with a dry cloth or a water-wet cloth, will be necessary. This can double the time to perform the operation which may not be acceptable to all firms.

An important regulatory issue arises with the use of the combustible solvents. When RCRA was first written, many of these solvents were not used widely. As a consequence, they are not listed under RCRA as hazardous wastes. The flash points of many combustible solvents are above 140° F, the cutoff level for characteristic ignitable hazardous waste. Unless the contaminants removed in the cleaning process are hazardous waste themselves, the combustible solvents do not have to be disposed of as hazardous waste.

This poses a policy issue. Many of these solvents, as discussed earlier are either known to be toxic or are unscrutinized and may be found to cause problems at a future date. Baths of the solvent and rags containing the solvent can be disposed of as sanitary waste or they may simply be poured into the sewer. These practices are not responsible, but they may be legal.

A related problem is that the combustible solvents are generally not included on other lists of toxic or hazardous chemicals. Most do not appear, for instance, on the CAA HAP list or on the SARA Title III list. Neither do they appear on California's Proposition 65 list or the Toxic Hot Spots list. For example, EPA has released a report designating NMP, a combustible solvent being marketed heavily, as a reproductive and developmental toxin. Even so, it does not appear on RCRA or any Federal or California list of hazardous or toxic chemicals. Yet the chemical can be poured into the sewer or disposed of in sanitary landfills.

As discussed in Section 3, certain air regulations do affect the combustible solvents since they are all VOCs. If a firm converts from an exempt solvent, like TCA or CFC-113 to a combustible solvent, local air district regulations may require offsets. Depending on the rules of the local air districts, the solvents may not be allowed to be used in certain applications. For example, SCAQMD Rule 1171 would forbid the use of any of the combustible solvents in substrate surface preparation processes that are part of a manufacturing process because the VOC content of all of them exceeds the allowable level of 70 g/L.

Other air district regulations for bath cleaning operations have certain requirements that must be met. These rules generally have not been revised to accommodate the transition away from ozone depleting and chlorinated solvents. For example, the rules may require equipment containing the combustible solvents to have a particular freeboard height or a refrigerated freeboard chiller. Much of the equipment appropriate for use with these solvents has not been designed with these requirements in mind.

4.2.3 HCFCs As discussed earlier, three HCFCs that are liquids at room temperature are suitable for solvent applications. These include HCFC-141b, HCFC-123 and HCFC-225. Early on, these solvents were thought to pose great promise as alternatives to the chlorinated solvents. Because they do not have flash points, they can be used in vapor degreasing processes as well as cold cleaning, printed circuit board defluxing and wipe cleaning operations. They have high vapor pressures, like the chlorinated solvents, which means they evaporate readily. HCFC-141b and HCFC-123 have good solvent cleaning capability whereas HCFC-225 has a more gentle solvency, like CFC-113.

The cleaning equipment proposed early on for these solvents was designed to be lower emitting than the equipment used with the chlorinated solvents. The boiling points of HCFC-141b and HCFC-123 are very low and the solvents would be more expensive than the other chlorinated solvents. Thus, there was effort devoted to designing equipment to minimize emissions. The equipment included very high freeboards, triple refrigeration coils and various other additions that would reduce evaporative losses.

The promise for the HCFCs has now dimmed and it is unlikely that any of the three solvents will be used in solvent cleaning applications in the U.S. HCFC-141b has an ozone depletion potential that is higher than that of TCA and production of the latter chemical is slated to be banned on January 1, 1996. It did not seem reasonable to allow users to replace one chemical with another that had a higher ozone depletion potential. EPA's SNAP regulation forbids the use of HCFC-141b in virtually all cleaning applications. Furthermore, because of its high ozone depletion capability, production of the chemical will be banned altogether in the year 2003; after that date, it cannot be produced for use in refrigeration or foam applications either.

The HCFCs, because they would eventually have widespread use, were tested voluntarily by the producers for toxicity. HCFC-123, in the chronic toxicity tests, caused benign testicular tumors in male rats and benign pancreatic tumors in male and female rats. At that stage, DuPont, the likely major producer of the chemical, lowered the allowable exposure level of the chemical to 10 ppm. This effectively prevented its sale for solvent applications. More recently, as the toxicity data have been examined, the exposure level has been increased to 30 ppm. Nevertheless, the producers do not plan to offer the chemical for use in solvent applications.

HCFC-225 is essentially a drop-in alternative to CFC-113 in terms of its physical properties. The chemical is produced as a mixture of two isomers, one of which appears to be quite toxic. One Japanese producer plans to go forward with manufacture of the chemical, pending the results of toxicity tests. U.S. producers have declined to produce the chemical. It is not clear, at this stage, whether a production process that selectively produces the non-toxic isomer is cost effective. Commercial production cannot go forward until the toxicity testing is completed and the HCFCs are slated to be banned in the next century. Because users must adopt alternatives soon due to the pending ban, HCFC-225 is not a good alternative. Its gentle cleaning capability makes it a candidate for CFC-113 replacement but it does not have strong enough solvency to replace the other chlorinated solvents in most applications.

4.2.4 HFCs The HFCs, unlike the HCFCs, do not deplete the ozone layer since they contain no chlorine or bromine. Because they contain fluorine, however, they do contribute to global warming. As discussed below, the presence of the hydrogen atom in the chemical shortens the lifetime of these chemicals substantially and they are much lower than the lifetimes of the FCs, which contain no hydrogen.

The HFCs, also because they contain no chlorine, are poor cleaning agents. Nevertheless, they do have some cleaning capability and they are likely to be used in certain niche applications. For instance, in cases where displacement drying is needed, the HFCs would be suitable. In the cleaning of movie film, which employs TCA today, an HFC will probably be used. Other precision cleaning uses, like particulate removal, may employ the solvent.

Dupont is pursuing one particular HFC, HFC-43-10, for these applications. Toxicity testing is underway and the results should be available in June, 1994. At that time, if the toxicity profile appears to be good, the chemical will become commercially available on a larger scale. DuPont has tested the chemical for film cleaning (Wolf and Jones, 1993) and it appears to be a viable alternative to TCA. Other testing has been conducted and the HFC seems to have applicability in certain specialty applications. Other manufacturers are also pursuing other HFCs but they have not been identified publicly. The hydrogen in the HFCs increases the likelihood of toxicity and the challenge is to identify an HFC that is a liquid at room temperature and has low toxicity.

HFC-4310 forms azeotropes with several other chemicals which, in the combination, could improve the cleaning capability. However, most of the chemicals it would be combined with are flammable, combustible or chlorinated solvents, and the resulting combination would have the limitations of these latter chemical classes. If the HFC were combined with alcohol, for example, the presence of the HFC might suppress flammability, depending on the amount of alcohol present, but the alcohol is still a VOC.

The HFCs are obviously not listed wastes under RCRA. Neither do they fall into the category of a characteristic waste. Thus, unless the contaminants that are removed are hazardous wastes, the spent chemical can be disposed of as sanitary waste. Again, this is probably not good public policy and the State should move to rectify this issue. Because the HFCs are expensive, recyclers will probably be willing to pay users a large fee for disposing of the chemical. They may be recycled and sold back into the market and this may be the mechanism for ensuring that proper disposal occurs.

As described in Section 3, the government has adopted the Climate Change Action Plan that will limit the growth in global warming emissions. It is so far a voluntary plan but the environmental community is committed to making it mandatory. It is likely that emissions of global warming gases will be restricted and/or taxed in the future. A tax on global warming gases would likely be set according to the global warming capability of the particular gas. For HFCs which have relatively low global warming potential compared with the FCs, the tax will be lower. Nevertheless, because the price will rise to discourage use of the chemicals, they should be used only where other options are unsuitable and they should be controlled well.

4.2.5 FCs The FCs or PFCs are fully fluorinated chemicals. Since they contain no hydrogen, their atmospheric lifetimes are very long. Whereas the CFCs have atmospheric lifetimes of about 100 years, the FCs have atmospheric lifetimes of 3,000 to 5,000 years. The major disadvantage to the use of these chemicals is that they will probably be regulated. Again, as discussed above, the form of the regulation is likely to be a tax. This tax will probably be very high for the FCs since it will be set according to the global warming potential of the chemical.

Another strong disadvantage of the FCs is that they are very poor cleaners, much poorer even than the HFCs. They may have potential use in drying or certain specialty applications but they are unlikely to be good replacements for the chlorinated solvents in most applications.

The PFCs, like the HFCs, are not listed or characteristic hazardous wastes under RCRA. They can be disposed of in sanitary landfills if they contain no hazardous contaminants. Again, because of the expense of the solvents, proper handling practices may become routine. Recyclers are likely to find the chemicals desirable.

4.2.6 BHCs Only one bromohydrocarbon, methylene bromide, is being marketed as a potential solvent. The chemical is being combined with a terpene and it is referred to as a "brominated terpene." The terpene apparently serves as a stabilizer for the methylene bromide. The mixture is volatile and does not have a flashpoint; in principle, it could be employed in existing vapor degreasers.

According to EPA, methylene bromide has an ozone depletion potential of 0.17, which is higher than that of TCA (SNAP, 1994). The chemical is also quite toxic and, in fact, is more toxic than methylene chloride, which is a suspect carcinogen. Under the SNAP Program, EPA plans to forbid its use as an alternative to CFC-113 and TCA because of its high ozone depletion potential and its toxicity. It is not likely that the chemical will be used in the future for this reason.

4.2.7 FICs Fluoroiodocarbons as a chemical class are being investigated for their potential as solvents. All of those being evaluated are straight chain compounds that are fully fluorinated except for one iodine atom. Those that are liquids at room temperature and might therefore be considered as solvents include the two-carbon chain and higher members of the class. The FICs have no flashpoints and the group investigating them is testing their cleaning capability alone and in combination with other flammable and combustible solvents.

The group that is marketing the chemicals claims that the FICs have short atmospheric lifetimes of about two days and that, because of the short atmospheric lifetimes, they do not contribute to ozone depletion or global warming. They also claim that the FICs are not VOCs because iodine has been shown to decrease lower atmospheric ozone (Nimitz, 1993). Even if this were the case, it would not mean that the radical formed after removal of the iodine atom was not photochemically reactive. The group apparently has not submitted a petition to EPA for exemption from smog regulations.

The toxicity of the FICs has not yet been examined. One source (DuPont, 1994) indicates that molecules with this structure were evaluated in the 1980s and that they showed substantial toxicity. This issue will have to be investigated before the chemicals are brought to market.

Not enough is known about the toxicity, cleaning capability or properties of these solvents to speculate on the regulations that might affect them or the end uses where they might be employed. Presumably these issues will be resolved over the next several years.

4.3 Other Solvent Classes and Class Combinations

A variety of other chemicals and combinations of chemicals are potential alternatives to the chlorinated solvents. These include monochlorotoluenes/benzotrifluorides, volatile methyl siloxanes (VMSs) and PFC/combustible solvent combinations. Each of these chemicals and the processes for using them are discussed below.

4.3.1 Monochlorotoluenes/Benzotrifluorides Monochlorotoluene (MCT) actually consists of three isomers, including parachlorotoluene, orthochlorotoluene and small amounts of metachlorotoluene. These and two other chemicals, parachlorobenzotrifluoride (PCBTF) and 3,4-dichlorobenzotri-fluoride (DCBTF), are being marketed as replacements for chlorinated solvents (Ostrowski, 1993). The atmospheric lifetimes of the solvents are being investigated to evaluate whether the chemicals should be classified as VOCs.

Some of the chemicals are flammable and the producer has added small amounts of PERC to certain of the formulations to reduce flammability. The chemicals have not been tested for chronic toxicity and they are currently undergoing short-term toxicity testing. Their structure, however, indicates that toxicity could prevent them from being marketed. EPA's SNAP rule lists these chemicals as pending substitutes; the Agency will rule on the acceptability after the toxicity testing results are available.

4.3.2 Volatile Methyl Siloxanes VMS fluids are being offered as cleaning agents for precision cleaning applications. They are apparently technically suitable for removing cutting fluids, greases and silicone fluids. The VMSs have either a linear or cyclic structure containing silicon. The VMSs are flammable or combustible and they are less aggressive solvents than CFC-113 (Burrow, 1993); as a result, they have poor cleaning capability and they would not be suitable as replacements for TCA and the other chlorinated solvents in demanding cleaning applications. Their primary facility would be in precision cleaning and drying tasks.

Studies conducted at U.C. Riverside indicate that the atmospheric lifetime of the VMS fluids ranges from 10 to 30 days. Dow, the producer of the VMSs, has petitioned the EPA to exempt the chemicals from VOC regulations. Generally chemicals must have atmospheric lifetimes of at least 2 months to qualify for exemption. Unless or until they are specifically exempted, the VMSs must be considered to be VOCs.

4.3.3 PFC/Combustible Solvent Combinations This mixture is used in a cleaning process described as Advanced Vapor Degreasing (AVD). The process has been designed to minimize the disadvantages of the two components. The PFC used in the process is a six carbon straight chain fully fluorinated chemical that has no flash point. Its cleaning capability is very poor. It is combined with a combustible solvent in a proportion that renders the combination nonflammable. The combustible solvent performs the required cleaning and the PFC displaces the combustible solvent (which does not evaporate readily), leaving a clean and dry surface.

This combination solvent is being marketed for use in existing and modified vapor degreasers; it is a potential alternative to the chlorinated solvents in vapor degreasing applications. It apparently can be heated to its boiling point since it is not flammable. It is not clear whether the mixture is a true azeotrope; that is, a solution where the composition of the liquid and vapor is identical. If it is not a true azeotrope, there could be selective evaporation of the more volatile component --

in this case, the PFC -- leaving a combustible solvent at a temperature that exceeds its flash point. This would be a dangerous situation.

The disadvantage of this blend is that the PFC is a strong global warming gas with an atmospheric lifetime of some 3,000 years; it is likely to be regulated eventually for this reason. The EPA SNAP rule restricts PFC uses to certain applications. The combustible solvent, like other combustible solvents, has a flash point and is a VOC; it also has unknown toxicity. Because one of the components is a VOC, an air district permit may be difficult to obtain in most areas in California. The combination is probably not classified as hazardous waste unless the contaminants that have been removed are so classified. The blend is very expensive and, unless it is used in very tight equipment, would be a very high cost option.

SECTION 5:
PROCESS ALTERNATIVES TO CHLORINATED SOLVENTS

There are a variety of alternative processes that can be substituted for chlorinated solvents in cleaning applications. Some of these processes are applicable to only a very small portion of the market. They are discussed here and their advantages, disadvantages and applicability are presented.

5.1 No Clean Technologies

This category includes a range of different methods and technologies that make cleaning unnecessary. Generally, these techniques are process specific and careful matching of characteristics or process control is required. It is likely that there are many more operations that could utilize these technologies but the option is not readily seen and implementing it might require substantial effort. Several instances where cleaning is unnecessary are described below.

5.1.1 Use of Fluids Not Requiring Removal An alternative to cleaning is to use products that have been specifically designed to be compatible with subsequent processing steps and not interfere with the operations so the cleaning step can be eliminated. Oil based products are available that can be designed to be welded over, vaporized in processing or to have paint compatibility. So-called vanishing oils are generally based on mineral spirits containing metal working additives. The light residue from the lubricant provides short-term rust protection and often, the parts can be welded, brazed and painted without cleaning. Some water-based lubricants can be painted over without cleaning or they can be put through welding and brazing systems without cleaning. There are many waterborne paint systems that are compatible with water-based lubricants (Landers, 1993).

This option is technically applicable in cases where oil is added to parts to perform certain operations. Whether or not it is technically suitable is obviously case specific. Users must be willing to pursue this alternative rather than to assume that cleaning is necessary. This method is obviously not suitable for "job shop" types of operations where the parts come to the shop containing the contaminants.

5.1.2 Use of No-Clean Flux This option is applicable in PC board defluxing operations. Today, rosin-based fluxes are often used to prepare the boards for soldering. The components are soldered to the boards and the flux is commonly removed with either a CFC-113 or TCA formulation containing alcohol. The alcohol is necessary since flux is ionic and the solvents, by themselves, would be unable to remove it.

Historically, no-clean flux contained aggressive halide activators that could lead to later board failures; users understandably were cautious about adopting them. Today, there are many less aggressive fluxes and they are being adopted increasingly. The so-called no-clean fluxes are actually low-solids fluxes which contain between about 3 and 5 percent solids. This is in contrast to traditional rosin fluxes which contain 25 or 30 percent solids. The thesis is that the low solids in the no-clean flux can be left on the board and need not be removed, making cleaning unnecessary.

Many users in the commercial sector are investigating and adopting no-clean fluxes. They have been difficult to use since stringent process control is required. However, many of the bugs have been and continue to be worked out. Many industry experts believe that the future of PC board manufacturing lies in the use of no-clean flux. The major resistance to adopting the flux comes from the military sector which is often still wedded to the use of rosin based flux with solvent cleaning. As this sector shrinks, the trend to no-clean is likely to become more pronounced.

5.1.3 Fluxless Soldering A new technology called ROSA (reduced oxide soldering activation) is being investigated; its use would eliminate the cleaning requirement for PC boards (Hwang, 1994). One of the major reasons flux is added to boards is to prevent oxidation of the tin, tin/lead or copper surfaces. With the ROSA technique, the oxides are removed by processing them in an aqueous solution containing highly reducing vanadous ions that can be continuously regenerated by an electrochemical process in a closed-loop system. No flux residue needs to be removed and cleaning is unnecessary. This technology is still in the development stage.

Another emerging technology, PADS (plasma assisted dry soldering), uses fluorine radicals to remove surface oxides of the boards (Hwang, 1994). The source of the fluorine is either carbon tetrafluoride or sulfur hexafluoride. The fluorine free radicals react with the oxides, forming a passivation film. As the solder melts, the film breaks apart, exposing the clean metal substrate that is now ready for wetting. This process, like the ROSA process described above, makes flux application and cleaning unnecessary.

5.1.4 Not Adding Contaminants Some processes can be accomplished without the addition of the contaminants that later require removal. Each process must be examined on a case-by-case basis to determine whether it can be changed sufficiently to make cleaning unnecessary.

In one case, for instance, a firm was joining a backing to a PC board metal heat sink. The backing was used to hold the sink steady during the stamping process and to prevent damage to the table underneath. A vapor degreasing process was the next step and it separated the backing from the stamped sink. When the assemblies were put on the coffee maker in the facility, the backing readily separated from the sink. It was concluded that the heat from the vapor in the degreaser was separating the backing from the sink and that a small oven could replace the large degreaser.

5.1.5 Vacuum Deoiling In this process, oil is removed from parts by placing them in a vacuum chamber with hot walls (Littlefield, 1991). The chamber is evacuated to remove oxygen and to degas the oils. It is then backfilled to a low vacuum -- in the 50 to 100 mm Hg range -- with nitrogen or another inert gas. An internal gas circulator is used to heat the parts by forced convection heating from the preheated chamber shell. After the parts reach the required temperature, the chamber is evacuated to 10 to 30 mm Hg. It is then backfilled with nitrogen or another inert gas. The parts are unloaded and put back into production.

The oil vaporizes from the part surfaces as the chamber pressure is reduced. It is drawn out the vacuum line to an oil condenser which is later heated, driving off the oils. The oils can then be reused or sold back to the supplier.

The vacuum deoiling method is suitable for parts contaminated with grease and oil. It may not be suitable for parts that have additional or other contaminants. Although this process eliminates the need for cleaning, the capital investment in the required equipment can be quite high. Both horizontal and vertical design chamber configurations are available.

5.2 Cleaning With Other Media

In some instances, solid media or inert gases can be substituted for traditional solvents for cleaning.

5.2.1 Absorbent Cleaning This technique involves using absorbent media rather than solvents for removing oils from parts. Boeing has been investigating various media, including wheat starch, walnut hulls, corn cobs, rice hulls and sponge jet foam, for removing machining and forming lubricants and hydraulic fluid from aluminum parts. The method uses, in some cases, a blast cabinet to apply the media. The work is on-going and the initial effectiveness was less than anticipated (Golden, 1993).

5.2.2 Supercritical Carbon Dioxide This method utilizes carbon dioxide at its supercritical point (very high pressure) to remove contaminants from parts. At the supercritical point (31° C and 74 bars pressure), carbon dioxide -- normally a gas at room temperature and pressure -- exhibits liquid-like densities and liquid-like properties. At this stage, it is a good solvent for nonpolar or slightly polar compounds. It also has gas-like characteristics which leads to improved mass transport and no surface tension. As a consequence, it can penetrate blind holes and crevices to effectively remove oils and other nonpolar contaminants. The method has been used for many years in extraction processes including caffeine and hops extraction and has, for the last few years, been investigated as an alternative to solvents in cleaning.

The method is not suitable for cleaning parts with hermetically sealed items since the high pressures required to achieve the supercritical point crushes them (Hale, 1992). Polar contaminants, like solder flux, are difficult to remove with the method. In principle, a cosolvent that is polar, like water or alcohol, might be combined with the carbon dioxide for polar contaminant removal. The two-component process would be very complex, however, and it has not been investigated fully. Supercritical carbon dioxide is not suitable for removing particles but liquid carbon dioxide may be technically suitable for this purpose (Hale, 1992).

Carbon dioxide is compatible with many metals including stainless steel, copper and gold, porous metals and silica and alumina ceramics. Compatibility with polymeric and composite materials must be determined on a case-by-case basis (CF, undated).

The advantage of the system is that the contaminants are the only remaining process residue that require disposal. The carbon dioxide can be separated from the oils by pressure control since carbon dioxide is a gas at ambient pressure and the contaminants are liquids or solids. The carbon dioxide, free now of the contaminants, can then be recycled and reused in the next operation.

This method is most applicable to cleaning high value, small parts contaminated with nonpolar contaminants. It is only suitable for batch operations since pressurized vessels are required. Small systems exceed $100,000 in cost so the process must be high value. One application where the process is being implemented is for removing organic contaminants from plutonium parts (Hale, 1992). This method allows the removal of the oil without generating another mixed hazardous/radioactive waste requiring disposal.

5.2.3 Carbon Dioxide Snow Two methods of using carbon dioxide snow are possible. The first method uses pressurized liquid carbon dioxide to remove sub-micron particles and other contaminants from precision parts and assemblies like disk drive components and subassemblies, optics, semiconductors and medical devices. In these applications, the carbon dioxide is passed through a specially designed nozzle to create a mixture of dry ice snow crystals and carbon dioxide gas. The jet is directed to the surface of the part requiring cleaning. The snow crystals sublime (convert to a gas) and the carbon dioxide gas carries away the contaminants, leaving no residue. Some of the systems are small, hand held manual systems and others are fully automated computer-driven and integrated into the process.

Particles and thin films of hydrocarbon and silicone oils have been successfully removed using this technology. The cost of these systems ranges from $1,000 to several thousand dollars depending on the complexity of the system required.

The second method of using carbon dioxide is designed for large, heavily contaminated industrial equipment. These systems can perform manufacturing-related cleaning without disrupting production. In-place production equipment and tooling can be cleaned without the need for disassembly. The high pressure units designed for this purpose have been used to clean manufacturing equipment like robots, rollers, mixers and conveyors; in-place molds; continuous web production equipment; and electrical panels and controls (Alpheus, undated).

There are two possible disadvantages of carbon dioxide snow systems. The first is that the technique is line-of-sight so it is not suitable for parts with contaminants that must be removed from crevices, blind holes or other inaccessible locations. The second is that carbon dioxide, a greenhouse gas, is emitted to the atmosphere. The carbon dioxide used in these processes is taken from other processes that emit carbon dioxide so use of the method does not increase carbon dioxide emissions. Nevertheless, it is possible that a local air regulatory agency might eventually place controls on the level of carbon dioxide emissions under their jurisdiction.

A distinct advantage of the method is that the only hazardous waste resulting from the process is the contaminants that have been removed. When liquid solvents, water or media are used for cleaning, the cleaning agent can become hazardous waste and it will require disposal. In this case, since the carbon dioxide sublimes, the only material requiring disposal is the removed contaminants.

5.2.4 Nitrogen In some cases, hot and/or pressurized nitrogen can be used for cleaning in place of solvents. It is especially applicable when particles or low levels of organics require removal from confined spaces like pipes, tubes or other assemblies. Chlorinated solvents have commonly been used for flushing in these operations.

One example is the engine testing performed by a large aerospace firm. This firm used TCE for flushing shuttle engines after testing. Many alternatives were tested, including water formulations which offered promise. In the end, however, the firm was able to demonstrate that heated and pressurized nitrogen was capable of removing the organic contaminants that coated the inside of the engine chambers as unburned or burned fuel residue (O'Rourke, 1993). Use of nitrogen was a better option than water. The nitrogen, since it is a gas, can be easily separated from the organic contaminants and these contaminants are the only waste.

Other examples where this technique might be applicable include tube cleaning where particles and organics require purging. An aerospace subcontractor historically flushed tubes containing small amounts of oil from the fabrication process with CFC-113. After the CFC-113 was used to remove the organics, the tubes were dried with nitrogen. Nitrogen alone was found to be a suitable alternative for both the cleaning and drying, which allowed the firm to avoid the use of water.

In PC board defluxing, inert gas soldering with nitrogen is increasingly being adopted by firms. Flux is generally added to the PC boards prior to soldering to prevent oxidation of the board. Inert gas soldering involves using a nitrogen atmosphere and only a very small amount of flux to prevent the oxidation. The oxygen is evacuated from the system and is replaced with nitrogen; this prevents the board from being oxidized during the soldering process. Virtually no flux is applied to the board and cleaning of the flux after the process is not necessary.

5.2.5 Spectroscopic Cleaning Methods of cleaning that utilize the interaction of light with surfaces are being investigated. Some of these are currently being used in paint stripping applications; they are less appropriate for cleaning. Lasers and flashlamps are being evaluated. The principle is that the surface contaminants will absorb the light of a particular frequency and the substrate material will not. The contaminants absorb the light and decompose and the surface is clean. The advantage of this method is that the amount of waste generated, as was the case for carbon dioxide snow, is minimized and limited to the decomposed contaminants.

There are several disadvantages to using this method in cleaning. First, the contaminants could decompose to yield harmful materials and worker exposure to the dangerous substances would have to be prevented. Second, in certain instances, the technology itself would pose a danger. Lasers, for example, might have to be used with automated equipment. Third, substrate damage could occur if the frequency of the light is not chosen judiciously. Fourth, the technique is a line-of-sight method and is not suitable for parts with complex geometries.

SECTION 6:
WATER-BASED CLEANING

In Section 4.0, a generic classification scheme for evaluating and selecting a suitable chemical alternative was described. When users are presented with a new chemical being marketed by a vendor, that chemical can be placed into a generic chemical class. Given a knowledge of the chemical class into which an alternative falls, the user will also know many of the properties of the chemical and the environmental problems posed by the chemical. The user can then eliminate chemicals from further consideration easily or, with a knowledge of the limitations, can conduct testing on a limited number of chemical alternatives.

In most vapor degreasing and cold cleaning applications where chlorinated solvents are used today, water-based cleaners are suitable alternatives and solvents need not be evaluated at all. In fact, IRTA's field experience suggests that perhaps as many as 95 percent of the bath cleaning operations using chlorinated solvents today could be converted to water. In a substantial fraction of the handwipe applications, water is likely to be appropriate as well. Because water-based cleaners allow users to avoid the use of traditional solvents, they are "better" than chemical alternatives because their use minimizes environmental and human health problems. Only in cases where the process is water-intolerant from a technical standpoint should chemical alternatives be considered.

Firms are often reluctant to consider water alternatives. They have used solvents for years and they simply do not believe that water -- even with the proper additives -- can effectively clean parts. These users are strongly biased in favor of solvents. If there were a safe solvent with virtually no environmental problems that had the physical properties of the chlorinated solvents, then this bias would be justified. There is not now and there will not be a "drop-in" solvent alternative. This means that a compromise must be made and that compromise might as well be made with water.

There are hundreds and perhaps even thousands of water-based cleaning formulations being offered by vendors. Firms often spend large amounts of time and significant resources testing tens or hundreds of water cleaners. This section describes a systems approach to choosing a water based cleaning formulation that will reduce the number of cleaning formulations that require testing. It allows the user to select only those cleaners that appear to be the most environmentally sound and to conduct testing on only a few cleaners. This minimizes the time and resources required to effect the conversion.

6.1 The Cleaning Process

In general, users want to remove contaminants of various types from their parts so they can perform subsequent operations. These operations include fabricating metals, plastics or other substrates, plating, anodizing, chem filming, and applying adhesive or coating. In other cases, cleaning is the last step in the fabrication process before the product is sent for display or to customers. Contaminants requiring removal are numerous; they include oils, dirt, grease, flux, particulates, fingerprints and metal fines.

In some instances, as discussed in earlier sections, when users reevaluate their processes, they may find that cleaning is not necessary at all. Some parts that are cleaned using solvents today may simply not be dirty; others may require only a simple surface wipe with a rag. In other instances, users may be able to adopt various other technologies. One example is the use of no-clean flux for printed circuit boards. In still other instances, water alone may be capable of cleaning the parts sufficiently. The pressure, for example, of a wet rag in a handwipe operation may be adequate to remove particulates from a part.

In cases where more aggressive cleaning is required, water-based formulations or solvents will be required. A general rule is that "like" removes "like." That is, ionic contaminants like fingerprints or flux are best removed with alcohol or water which are ionic solvents. Oils, which are organic in nature, are often best removed by organic solvents. Water can be used to remove oils, however, if surfactants that make the oil and water miscible are added. Wetting agents in water-based cleaners will allow the cleaner to penetrate and loosen the bond between the contaminant and the substrate by lowering the surface tension. Once wetting occurs, the oil droplets are coated with a thin film of surfactant which prevents them from redepositing on the substrate. Thus water-based cleaning agents can be formulated to contain additives that will remove both ionic contaminants and organic contaminants.

6.2 Water Bath Cleaning Processes

In general, water cleaning bath operations require at least two stages and, in many cases, three or more. The first stage is the cleaning step. More than one cleaning stage may be required depending on the extent and type of the contamination. The second stage is the rinse stage. Because the water cleaning formulations contain additives, these additives must be rinsed from the parts. More than one rinse step may be required depending on the cleanliness requirements. The third step is drying. In some cases, the parts may not require drying if the next processing step is aqueous-based, like plating or anodizing.

Mechanical methods can be combined with water cleaning formulations for better effectiveness. It is the mechanical action in the cleaning process that will help to remove particulates and metal fines through displacement. Mechanical action of the appropriate kind will also increase the removal rate of organic and ionic contaminants. As discussed later, the proper kind of equipment and fixturing for a specific operation is essential.

Five variables are important in the cleaning process. The first variable is the amount of the concentrate or the additives in the cleaner. The second variable is the temperature used in the cleaning bath. The third variable is the cleaning time. The fourth variable is the mechanical action used in the cleaning process. The fifth variable is fixturing. Each cleaning application requires the optimization of these variables for the specific process.

A typical cleaning process with water would be operated as follows. One part concentrate is diluted with ten parts tap water in the cleaning chamber. The formulation is heated to between about 110 and 170° F, depending on the soil and substrate. The parts to be cleaned are placed in a basket and cleaned. Depending on the type of equipment, the parts might be spray-in-atmosphere cleaned, submerged and agitated vertically or horizontally or sprayed under immersion. The cleaning cycle might take 1 to 10 minutes. The parts are removed and placed in the rinse chamber where again, they may be spray rinsed or immersion rinsed. This activity may require 3 minutes. The parts may then go on to be further processed or they may be dried. A variety of drying mechanisms including hot air drying, infrared (IR) drying or vacuum drying are available.

The rinse bath can generally be plumbed directly to the sewer. The rinse bath contains only small amounts of contaminants which have been largely removed in the cleaning bath. It also contains only small amounts of the additives from the cleaning concentrate. A sanitation permit will most likely be required to release this water to the sewer. As discussed earlier in Section 2, the requirements of each local sanitation district differ depending on the other streams the POTW is receiving. Another option is to use the first rinse as makeup water for the wash bath; water evaporates slowly and must be replaced periodically. The second rinse can then be used as makeup for the wash bath and so on. Only the final rinse, in this case, would be plumbed to the sewer. Yet another option is to close loop the rinse bath; this would require filtration.

The wash bath is used continuously to clean parts. The water cleaning formulations used for cleaning parts are generally alkaline; that is, they have a pH above 7. When the concentrate in the wash bath becomes depleted, more must be added to ensure good continuing cleaning capability. Distributors often supply users with a test kit that measures the alkalinity of the wash bath. If the concentrate is depleted, the user adds more concentrate to increase the concentration to the required pH or alkalinity level.

As parts move through the equipment, the cleaning formulation eventually becomes contaminated. Common contaminants that are removed include oils of all kinds and particles. A filter can be used to remove the particles from the wash bath. For many operations not requiring precision cleanliness, an oil skimmer can be used to remove the oil from the cleaning bath. Two types are available: a disc skimmer and a belt skimmer. If more stringent cleanliness standards for the oil must be met, then coalescers, filtration devices or ultrafiltration methods should be considered. These methods can be used continuously and the cleaner should be tested with the filtration method to ensure that filtration will not remove the active ingredients (surfactants, for instance) in the water formulation as the water passes through the filter.

An oil skimmer operates when the cleaning process is not operating. With certain water cleaners that are properly formulated, the oil rises to the top of the wash bath and the oil skimmer skims the oil from the surface. The oil is placed in a separate container, perhaps a drum, and it can be recycled or disposed of as hazardous waste. Even with the continuous oil removal, the wash bath eventually becomes too contaminated for further use. The timeframe varies and can range from 3 months to a year, depending on the contaminant loading in the particular process. At this stage, if the bath is hazardous waste, it should be disposed of properly. Generally, the wash bath will be hazardous waste if the pH is very high, if the cleaner contains solvent additives that are listed wastes or if the removed contaminants are listed wastes. Such cleaning baths rarely contain heavy metals which would also render them hazardous waste.

The cleaning process will vary depending on the type of equipment and the type of processing that the specific operation requires. For example, if a user has a conveyorized cleaning unit, then the parts move through the wash, rinse and dry chambers continuously. The equipment may contain multiple wash and rinse stages and ultrasonics or manifolds for fixturing.

6.3 Handwipe Cleaning Processes

So-called handwipe operations include traditional wipe cleaning that is performed with a cloth, rag or cotton swabs to remove contaminants from a part during the manufacturing process or prior to coating or application of an adhesive. It also includes repair and maintenance cleaning that is often performed with remote reservoir units today. The part is flushed to remove oil or other contaminants in a sink and the contaminated solvent is drained to a waste drum. Water formulations can be used for wipe cleaning in many instances. Equipment manufacturers are offering plastic or stainless steel remote reservoir units for use with water cleaning formulations.

6.4 Choosing a Water-Based Cleaner Water cleaning formulations are commonly offered in concentrate form. The concentrate contains the wetting agents, the surfactants, the builders that give it alkalinity, and other additives required for cleaning. The concentrate is diluted with water in accordance with the cleaning requirement. Most vendors recommend diluting to a concentration of 3 to 30 percent, depending on the demand of the cleaning task. For light cleaning applications, a solution containing 5 percent of the concentrate may be sufficient; for heavy oil contamination or heavy uncured resin residue, a 30 percent solution of the concentrate may be necessary. It is in the users' interest to dilute the concentrate as much as possible so the cost will be lower.

Many water-based cleaning formulations contain large amounts of solvent additives. Common additives include ethylene glycol ethers, propylene glycol ethers and terpenes. As indicated earlier, these solvents fall into the "combustible solvents" category and are classified as VOCs. Some of the glycol ethers are listed hazardous wastes. Terpenes are not listed hazardous wastes because they were not employed for cleaning when RCRA was written.

Certain of the glycol ethers have been found to cause birth defects. Another glycol ether -- 2-butoxy ethanol (also called butyl cellosolve) -- that is used widely in water based cleaners poses health problems and is likely to be regulated more stringently in the future. It is on the Hazardous Air Pollutant (HAP) list in Title III of the CAA Amendments, it is on the SARA Title III list and it is on the Toxic Hot Spots list in California. The propylene glycol ethers are a new class of glycol ethers and the distributors refer to them as the "good" glycol ethers. The reason they appear to be "good" relative to the other glycol ethers is that they have not been tested for chronic toxicity and there is no requirement for the manufacturers to do so. EPA is considering adding the propylene glycol ethers to the HAP list.

D-limonene, one of the major ingredients of terpene formulations, is sometimes employed in water-based cleaners as a solvent and sometimes for aroma. This chemical, and indeed all other terpenes, is extremely photochemically reactive. Moreover, EPA is concerned about the aquatic toxicity of the terpene family. The chemicals are very biologically active and environmental and human health problems associated with their use may emerge in the future.

Other "combustible" and "flammable" solvents are often added to water-based cleaners to improve their solvent action. Possible additives include NMP, DBE and alcohols of various types. Generally, for most cleaning applications, water formulations without solvents can be used successfully if the proper concentration, temperature, mechanical agitation and fixturing is employed. Thus, there is no reason to adopt a water-based cleaning formulation that contains solvents. In fact, one of the reasons for choosing a water-based cleaner is to avoid the use of solvents. The solvents increase worker exposure, cause smog, may require reporting if they are listed chemicals and may cause the spent formulation to be classified as hazardous waste.

Many distributors are offering water-based cleaners with very high pH, above about 12. Some of these cleaners have traditionally been used for etching and brightening applications by platers. They are not appropriate as substitutes for chlorinated solvents in the vast majority of cleaning applications. Formulations with much lower pH, in the 7 to 11 range, can usually be used effectively. A lower pH will reduce worker danger, may qualify the depleted wash bath for sewer release, and will keep the bath from being classified as hazardous waste from a pH standpoint alone. In California, if a user wants to neutralize an aqueous-based hazardous waste (before sewer release or off-site shipment), a hazardous waste treatment permit will be required. To avoid these problems and because many good, low pH cleaners are available, users should certainly screen out high pH formulations and not evaluate them further.

6.4.1 Cleaner Selection Procedure When firms are evaluating alternative cleaners, they should ask the distributor for a Material Safety Data Sheet (MSDS). In the case of water-based cleaners, the MSDSs are not particularly revealing. They can be used to quickly screen out cleaners that are not appropriate, however. To demonstrate how the screening evaluation might work, five MSDSs for aqueous based cleaners are included here. The names of the actual products are deleted and the names of the cleaners will be designated as Water Cleaning Formulation (WCF)-1 through -5.

WCF-1 is a multi-metal safe alkaline cleaner. Under the category of "Physical Data", the pH of a 1 % solution is listed at 11.9 and the pH of the concentrate is listed as greater than 13. This is an extremely high pH and, if the chemical were

APPENDIX I

DISTRICT RULES

- A Place For YOUR District's Rules -

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