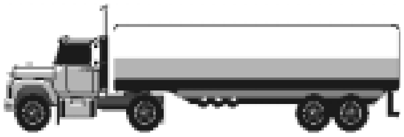
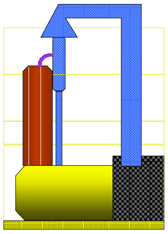
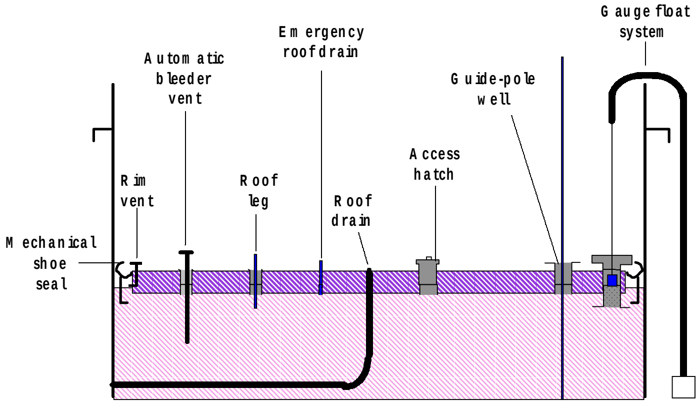
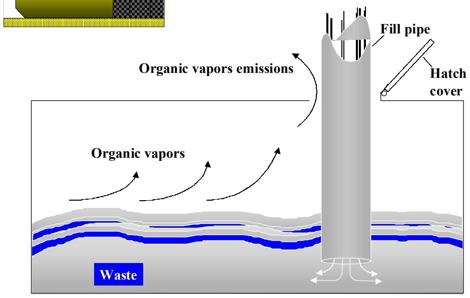
U.S. EPA REGION 4
RCRA ORGANIC AIR EMISSIONS
TRAINING AND ASSISTANCE

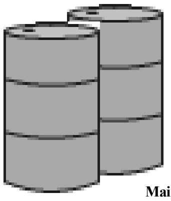
RCRA SUBPART AA, BB AND CC REGULATIONS
BODY OF KNOWLEDGE

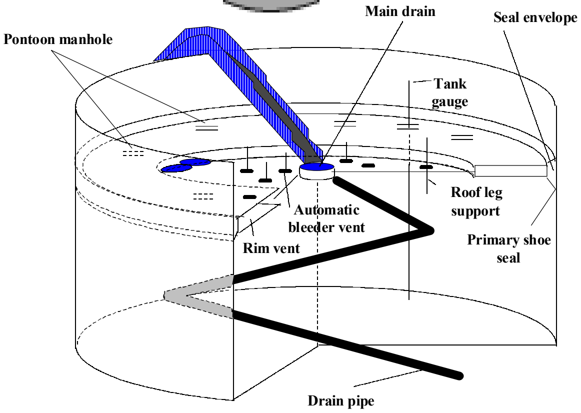


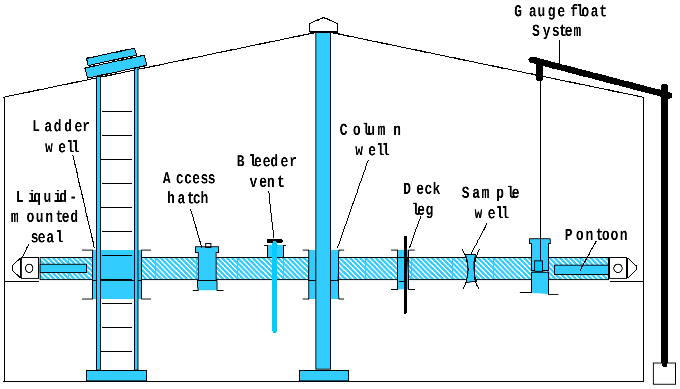












$$C_{VO} = \frac{1}{Q_T} \sum_{i=1}^{n} (Q_i C_i)$$

U. S. EPA REGION 4

RCRA ORGANIC AIR EMISSIONS TRAINING AND ASSISTANCE

RCRA SUBPARTS AA, BB AND CC REGULATIONS BODY OF KNOWLEDGE

FORWARD

This guidance handbook was produced by TechLaw, Inc. under contract to the U.S. Environmental Protection Agency (U.S. EPA) Region 4 for the RCRA Programs Branch of U.S. EPA Region 4. The purpose of this guidance is to present information to aid permit writers and inspectors in understanding and implementing the requirements of these environmental regulations. The guidance was developed by EPA Region 4 in cooperation with a few states as well as many EPA offices.

This guidance is to be used solely as guidance and cannot be relied upon to create any rights, substantive or procedural, enforceable by any party in litigation with the U.S. EPA. U.S. EPA reserves the right to act at variance with the policies and procedures herein, and to change them at any time without public notice.

EPA Region 4 would like to acknowledge the support of:

Abdool Jabbar, EPA Region 2
Carl Daly, EPA Region 8
John Crawford, Indiana Department of Environmental Management
Mike Mikulka, EPA Region 5
Janet Evans, Eastman Chemical
James Smith, Eastman Chemical
Rene Fuentes, EPA Region 10

These participants provided valuable information and assistance as per reviewers in the development of this manual and their efforts are truely appreciated.

U. S. EPA REGION 4

RCRA ORGANIC AIR EMISSIONS TRAINING AND ASSISTANCE

RCRA SUBPARTS AA, BB AND CC REGULATIONS BODY OF KNOWLEDGE

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

TABLE OF CONTENTS (Cont'd)

SECTION **PAGE**

Appendices

1.0 INTRODUCTION

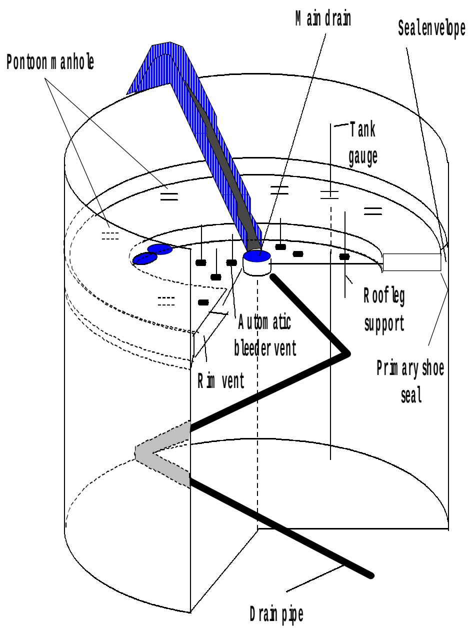
1.1 Purpose of this Handbook

RCRA air rules for process vents and equipment leaks have been in effect since June 1990. These RCRA air rules are referred to respectively as Subpart AA and Subpart BB standards in this manual based on their location in 40 CFR 264 and 265, Subpart AA (Air Emission Standards for Process Vents) and Subpart BB (Air Emission Standards for Equipment Leaks). RCRA air rules which regulate organic air emissions from tanks, surface impoundments and containers were published on December 6, 1994. These air rules are referred to as Subpart CC standards based on their location in 40 CFR 264 and 265, Subpart CC (Air Emission Standards for Tanks, Surface Impoundments, and Containers). The compliance deadline for the RCRA Subpart CC standards was December 8, 1997.

The regulations in Subpart AA affect process vents on any of the following equipment which processes hazardous waste with an annual average total organics concentration of greater than or equal to 10 ppm by weight: distillation columns, fractionation units, thin film evaporators, solvent extractors, and air or steam strippers. Subpart BB affects any pumps, valves, compressors, pressure relief devices, sampling connection systems, open-ended vales or lines, and flanges or other connectors, which contain or contact hazardous waste streams with equal or greater than 10 percent by weight total organics. All facilities subject to the Subpart AA and BB standards are required to submit the information specified in 40 C.F.R. §§ 270.24 and 270.25 upon request from EPA. The information required includes an identification and specification of the location of affected vents and equipment, the proposed method of compliance with the new standards, and documentation of compliance with the standards.

Subpart CC requires air emission controls be used for tanks, containers, miscellaneous units and surface impoundments which manage hazardous wastes containing an average organic concentration of greater than or equal to 500 ppmw at the point of waste origination. Specific exemptions to these requirements are outlined in the rule.

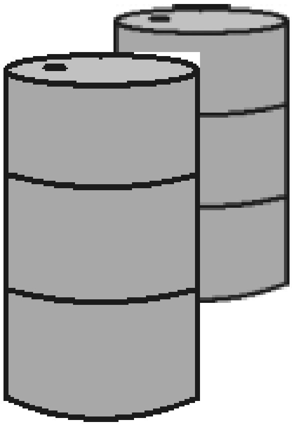
RCRA Subparts AA and BB standards apply only to treatment, storage and disposal facilities (TSDFs) that are subject to the permitting requirements of RCRA. However, the RCRA Subpart CC standards apply to both TSDFs and large quantity hazardous waste generator facilities that have on-site tanks and



containers used to accumulate hazardous waste for less than 90 days prior to its transfer to a permitted TSDF. As of December 8, 1997, each TSDF owner or operator and each hazardous waste generator subject to the RCRA Subpart CC standards must either install and operate the specified air emission control requirements on all affected tanks, surface impoundments, and containers, or begin performing the specified waste determinations and recordkeeping to indicate that the waste management units are exempted from these requirements.

This Book of Knowledge presents information on RCRA Subpart AA, BB and CC standards. Since Subparts AA and BB standards have been in effect since 1990, several other sources of guidance have been published to assist TSDFs with Subparts AA and BB compliance. Section 1.3 of this guidance manual contains a listing of other sources of guidance. Nevertheless, some information on Subparts AA and BB standards are presented in this guidance handbook. However, Subpart CC standards are covered in greater detail in this guidance handbook based on their more recent effective date and responses from industry which indicate more demand for Subpart CC guidance materials.

RCRA Air Rules Guidance Modules have been produced to complement the regulatory guidance that is presented in this Book of Knowledge Guidance. The guidance modules were developed to provide Subpart CC inspection and permitting assistance for waste management units which implement control option alternatives as provided for in Subpart CC. Guidance modules for many of the most common waste management unit/control option combinations have been prepared including:



- A fixed roof tank equipped with a closure device;
- A fixed roof tank connected to a closed-vent system that is vented to a vapor recovery/vapor reduction system (such as carbon adsorption or condenser system);
- A fixed roof tank connected to a closed-vent system that is vented to an enclosed combustion device (such as thermal vapor incinerator, boiler, or process heater);
- A fixed roof tank connected to a closed-vent system that is vented to a flare;
- A fixed roof tank connected to a closed-vent system that is vented to a control device other than a thermal vapor incinerator, flare, boiler, process heater; condenser, or carbon adsorption system;
- A fixed roof tank equipped with an internal floating roof;
- An external floating roof tank;

- A pressure tank;
- A tank located inside an enclosure system vented to an enclosed combustion device;
- A container meeting U.S. DOT regulations;
- A container equipped with a cover and closure device;
- A container operating with no detectable organic emissions;
- A container using an organic-vapor suppressing barrier;
- A vapor-tight container;
- A container vented directly through a closed-vent system to a carbon adsorption system;
- A container vented directly through a closed-vent system to an enclosed combustion device;
- A container vented directly through a closed-vent system to a flare; and
- A container vented directly through a closed-vent system to a control device other than a thermal vapor incinerator, flare, boiler, process heater, condenser, or carbon adsorption system.

Definitions for the terms used in Subparts AA, BB, and CC regulations are provided in 40 CFR 264.1031 and 265.1081. A copy of these regulations can be found on the EPA website at http://www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_40/40cfr264_00.html and http://www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_40/40cfr265_00.html.

1.2 Additional RCRA Air Standards References

U.S. Environmental Protection Agency. Hazardous Waste TSDF - Technical Guidance Document for RCRA Air Emission Standards for Process Vents and Equipment Leaks. EPA-450/3-89-021. July 1990

U.S. Environmental Protection Agency. Hazardous Waste TSDF - Background Information Document for Promulgated Organic Air Emission Standards for Tanks, Surface Impoundments, and Containers. EPA-453/R-94-076b. November 1994

2.0 OVERVIEW OF SUBPARTS AA, BB AND CC STANDARDS

2.1 Statutory Authority

Section 3004(n) of RCRA requires the U.S. Environmental Protection Agency (EPA) to develop standards to control air emissions from hazardous waste treatment, storage and disposal facilities (TSDF) as may be necessary to protect human health and the environment. This requirement reiterates the general requirement in RCRA section 3004(a) and section 3002(a)(3) to develop standards to control hazardous waste management activities as may be necessary to protect human health and the environment. The Agency has issued a series of regulations to implement the section 3004(n) mandate; these regulations control air emissions from certain process vents and equipment leaks (Part 264 and Part 265, Subpart AA and BB), and emissions from certain tanks, containers, surface impoundments and miscellaneous (the Subpart CC standards).

2.2 Regulatory History

The EPA issued the Phase I air regulations on June 21, 1990 [55 FEDERAL REGISTER (FR) 25454]. Phase 1 air rules regulated air emissions from certain process vents and equipment leaks as described in 40 CFR Parts 264 and part 265, Subparts AA and BB. On December 8, 1997, revisions were made to the Subpart AA Rules [62 FR 64635-64671} to amend 40 CFR 264.1030 and 265.1030 to exempt from requirements of Supart CC any process vents at a facility where the facility owner or operator certifies that all of the process vents are equipped with and operating air emission controls in accordance with the process vent requirements of an applicable Clean Air Act (CAA) regulation codified in 40 CFR Part 60, Part 61 or Part 63.

The Phase II air regulations were published on December 6, 1994 [59 FR 62896-62953] to control organic air emissions from certain tanks, surface impoundments and containers. These regulations are codified in 40 CFR parts 264 and part 265, Subpart CC. The EPA published four documents to delay the effective date of the Subpart CC rule. The first (60 FR 26828, May 19, 1995) revised the effective date of the standards to be December 6, 1995. The second (60 FR 56952, November 13, 1995) revised the effective date of the standards to be June 6, 1996. The third (61 FR 28508, June 5, 1996) further postponed the effective date for the rule requirements until October 6, 1996, and the fourth (61 FR 59931, November 26, 1996) established the ultimate effective date of December 6, 1996. The EPA published Federal Register notices 61 FR 4903 (February 9, 1996) and 62 FR 64636 (December 8, 1997) to clarify amendments in the regulatory text of the final standards and to clarify certain language in the preamble.

The December 6, 1994 Final Rule set a final compliance date of December 8, 1997, by which all required air emission control equipment must be operating. This final compliance deadline has remained unchanged since the December 6, 1994, Final Rule was published. The basis for the decision not to revise the compliance deadline is that EPA believes that many air pollution control devices can be installed and in operation within a relatively short time period (several months).

2.3 Purpose of the Subparts AA, BB, and CC Standards

The RCRA air rules have been developed to reduce organic air emissions and their associated risk to human health and the environment. Volatile organic compounds are involved in the formation of ozone which has been shown to have harmful effects on human health and adversely effect agricultural production. Many volatile organic compounds may be classified as air toxics which also are responsible for adverse human health effects. Controlling releases of volatile organic compounds to the environment will reduce these adverse effects.

2.3.1 Ozone

Ozone is just one of six major air pollutants that are regulated by EPA but it is by far the most complex and the most difficult to regulate. Ozone is different from stratospheric or high level ozone in that it is detrimental to human health and welfare. Stratospheric ozone is the ozone layer that protects the earth from ultraviolet sunlight. Ozone is formed in the air by chemical reactions which may involve nitrogen oxides and volatile organic compounds. The reactions that form ozone are stimulated by sunlight, so that ozone reaches peak levels in most of the United States during the summer months. This type of pollution first gained public attention in the 1940's as Los Angeles "smog".

The chemistry of ozone formation is complicated and based on variable factors such as temperature level, quantity of sunshine and wind patterns. Even though substances other than volatile organic compounds play a role in the photochemical reaction that generates ozone, the EPA has determined that volatile organic compounds are a significant target for its efforts to control ozone.

Ozone may be responsible for many adverse health effects in humans. Ozone severely irritates the mucous membranes of the nose and throat; impairs normal functioning of the lungs and reduces the ability to perform physical exercise. The effects of ozone at any concentration are felt most by those with asthma, chronic obstructive lung disease such as emphysema, or allergies. When ozone levels are high, hospital admissions increase. There is more sickness generally and physical activity becomes difficult even for healthy individuals. Some acute health effects of ozone include inflammation of the lung, impaired breathing, coughing, chest pain, nausea and throat irritation. Chronic health effects caused by ozone include increased susceptibility to respiratory infection and permanent damage to lung tissue and breathing capacity.

Agricultural studies have indicated that high levels of ozone can cause a reduction in crop yields. One set of studies showed that even levels of ozone below health standard can reduce several major cash crops by as much as 10 percent a year. Studies involving higher levels of ozone have reduced plant yield in tomatoes by 33 percent, beans by 26 percent, soybeans by 20 percent and snapbeans by up to 22 percent.

Ozone has been responsible for lower forest growth rate and premature leaf-drop. Many scientists think ozone is a major contributor to the decline in growth of many species of trees. The existing data suggest strongly that ozone pollution has played a role in the loss of at least some forests. Repeated ozone peaks have been implicated in damage to white pine in the eastern United States and Canada and reduced growth rates for the red spruce at numerous high elevation sites in the Appalachian Mountains.

2.3.2 Air Toxics

Air toxics are air borne pollutants that can cause cancer or other human health effects. The total nationwide cancer incident due to outdoor concentration of air toxics in the United States has been estimated to range from approximately 1700 to 2700 excess cancer cases per year. The Clean Air Act amendments of 1990 identified 189 compounds as air toxics.

Air toxics come from thousands of point and area sources including process sources such as chemical production and fugitive sources which are on-site and resulting from leaks in pumps, valves, flanges, storage tanks, transportation railcars, and trucks.

The most common route of exposure to air toxics is inhalation after they are emitted from stacks. Ingestion is another form of exposure. After the toxics become airborne and then fall back to the earth, they are taken up by crops, animals and fish that are consumed by humans. Toxics enter the body through these routes and are accumulated over time and they have the potential to become highly concentrated in human fatty tissue and breast milk.

2.4 Other EPA Air Rules

Additional information regarding the interrelationship between the RCRA Air Emission regualtions and the CAA can be found in CAA and RCRA Overlap Provisions in Subparts AA, BB, and CC of 40 CFR Parts 264 and 264

Because the RCRA air emissions standards promulgated in Subparts AA, BB and CC apply to some of the same emissions sources that are subject to regulations established pursuant to the Clean Air Act (CAA), the potential exists for some overlap between the RCRA air rules and the CAA rules. In recognition of this potential overlap, Section 1006(b) of the Resource Conservation and Recovery Act (RCRA) requires that air standards issued under RCRA be consistent with and not duplicative of CAA standards. Similarly, the CAA voices a strong preference for consistency of CAA standards and RCRA standards. As a result, EPA has added a provision in the RCRA air rules that exempts any hazardous waste management unit from the RCRA rules that the owner or operator certifies is equipped with and operating air emission controls in accordance with an applicable CAA regulation codified in 40 CFR Part 60, Part 61, or Part 63. In order to provide environmental managers with a good understanding of these air regulations so they are able to determine if this exemption applies to their facility, each of these different type of air rules is discussed below.

Regulations codified in 40 CFR Part 60 are referred to as New Source Performance Standards (NSPS) and are promulgated under the authority of Section 111 of the CAA. These emission standards regulate pollutants for which EPA has established National Ambient Air Quality Standards (NAAQS). These pollutants include particulate matter, sulfur dioxide, nitrogen dioxide, ozone, carbon monoxide, and lead and are referred to as "criteria pollutants." Because ozone is formed from volatile organic compounds (VOCs) interacting with sunlight and nitrogen dioxide, VOC emissions are regulated in order to reduce ambient levels of ozone.

NSPS have been developed for over 50 source categories and apply to any facility in a regulated source category that is a new or modified facility. These NSPS require that any new or modified source apply the best demonstrated technology prior to construction or modification. Although attainment of the NAAQS is to be accomplished principally through control measures adopted by States, the emissions reductions obtained from the NSPS assist in the attainment and maintenance of the NAAQS in those areas in which such sources are located.

The Code of Federal Regulations (CFR) Parts, 60, 61 and 63 can be accessed via the internet at http://www.epa.gov/epacfr40/chapt-I.info/chi-toc.htm

Examples of NSPS that regulate sources that could also be subject to the air rules promulgated under RCRA include the NSPS for VOC Emissions from Synthetic Organic Chemical Manufacturing Industry (SOCMI) Reactor Processes (40 CFR Part 60, Subpart RRR), the NSPS for VOC Emissions from SOCMI Distillation Operations (40 CFR Part 60, Subpart NNN), the NSPS for VOC Emissions from SOCMI Air Oxidation Unit Processes (40 CFR Part 60, Subpart III), and the NSPS for Equipment Leaks of VOC in SOCMI (40 CFR Part 60, Subpart VV).

Regulations codified in 40 CFR Part 61 are referred to as National Emission Standards for Hazardous Air Pollutants (NESHAPs) and are promulgated under Section 112 of the CAA. Section 112 requires EPA to establish emission standards for hazardous air pollutants at the level which in EPA's judgement provides an ample margin of safety to protect the public from the health effects of the hazardous air pollutants. A hazardous air pollutant is defined as an air pollutant for which no NAAQS is applicable and which may reasonably be anticipated to result in an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness. To date, EPA has promulgated NESHAPs for only seven pollutants (asbestos, arsenic, beryllium, benzene, mercury, vinyl chloride, and radon) from a variety of different source categories.

NESHAPs apply to new, modified and existing sources. Examples of NESHAPs that regulate sources that could also be subject to the air rules promulgated under RCRA include the NESHAP for Equipment Leaks (40 CFR Part 61, Subpart V), and the NESHAP for Benzene Waste Operations (40 CFR Part 61, Subpart FF).

EPA's record in developing NESHAPs stemmed from the fact that it is very difficult to establish what level of control represents an ample margin of safety. Congress addressed this issue in the Clean Air Act Amendments of 1990 (CAAA) by listing 189 hazardous air pollutants and requiring EPA to develop a list of source categories which emit these pollutants. EPA must promulgate emissions standards for all these source categories such that 25 percent are regulated within two years of the CAAA; an additional 25 percent within four years, an additional 25 percent within seven years and the remaining source categories within 10 years of promulgation of the CAAA. The standards that have been developed to regulate these source categories are also referred to as NESHAPs. However, these NESHAPs are codified in 40 CFR Part 63 and are based upon the maximum degree of emissions reductions in new and existing sources. The control technology that represents the maximum degree of emissions reductions for new and existing sources is commonly referred to as Maximum Achievable Control Technology (MACT). Hence, these Part 63 NESHAPs are referred to as MACT standards.

2.5 RCRA Air Rules General Requirements

Examples of MACT standards that regulate sources that could be subject to the air rules promulgated under RCRA include the NESHAP for Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry (40 CFR Part 63, Subpart F), the NESHAP for Organic Hazardous Air Pollutants from the SOCMI for Process Vents, Storage Vessels, Transfer Operations, and Wastewater (40 CFR Part 63, Subpart G), the NESHAP for Organic Hazardous Air Pollutants from Equipment Leaks (40 CFR Part 63, Subpart H) and the NESHAP for Organic Hazardous Air Pollutants for Certain Processes subject to the Negotiated Regulation for Equipment Leaks (40 CFR Part 63, Subpart I).

Subpart AA standards regulate organic air emissions from process vents associated with one of five specific unit operations, which handle hazardous waste with a total organic concentration of 10 ppmw or greater.

Subpart AA standards were promulgated to regulate organic air emissions from process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations at hazardous waste treatment, storage, and disposal facilities. Facilities that are subject to the standards must monitor and, if necessary, control the organic air emissions from the affected process vents to assure that the total organic emissions from those vents be below the established short-term regulatory limit of 1.4 kilograms per hour (kg/h) and long-term regulatory limit of 2.8 Megagrams per year (Mg/yr). The owner or operator may also comply with the standards by using an approved control device to reduce the total organic air emissions from all affected vents at the facility by 95 weight percent.

Subpart BB standards regulate organic air emissions from equipment leaks, from equipment which contacts hazardous waste with total organic concentrations of 10 percent or greater.

Subpart BB standards were promulgated to regulate organic air emissions from equipment such as valves, flanges, open-ended lines, pumps, compressors, and sampling devices which contain or come into contact with hazardous waste. Control requirements according to the Subpart BB standards are dependant on the type of equipment and it's design, the layout of the facility (i.e., unsafe or difficult to monitor), and the characteristics of the waste that is being managed. Affected equipment must be identified, tagged and monitored and equipment which is found to be leaking must be repaired according to the requirements of the standard.

Subpart CC standards regulate organic air emissions from tanks, surface impoundments or containers which handle hazardous waste with average volatile organic concentrations of 500 ppmw or greater.

Subpart CC standards were promulgated to regulate organic air emissions from tanks, surface impoundments, and containers. Reductions in organic air emissions from these sources are achieved through applying controls to the affected equipment or through treating the hazardous waste by one of the methods specified in the rule.

2.6 Applicability Considerations

Subparts AA, BB, and CC standards apply to owners and operators of hazardous waste treatment, storage and disposal facilities (TSDFs) that are subject to the permitting requirements of 40 CFR 270 regardless of their permit status. The AA and BB standards apply to hazardous waste recycling units that manage waste for longer than 90 days provided that other units exist which subject the facility to the permitting requirements of 40 CFR 270. However, hazardous waste recycling units that manage waste for less than 90 days are not subject to the standards. Subparts AA and BB standards also apply to units other than hazardous waste recycling units that manage waste for less than 90 days.

Process vents on production units are not subject to Subpart AA standards. For example, a process vent which occurs on equipment such as a product distillation column which generates hazardous waste still bottoms is not subject to the standards. The Subpart AA standards are only applicable to process vents on units used to treat hazardous waste.

Facilities which are operating units that meets the requirements of applicable CAA regulations do not have additional equipment control requirements resulting from the RCRA air standards provided that the facility maintains appropriate records in accordance with the RCRA air standards.

Exemptions exist such that units which do not meet the general applicability requirements of 40 CFR 264.1 and 265.1 are not subject to the requirements of the RCRA air standards. Some of those exemptions exist for the following:

RECORDKEEPING REQUIREMENTS SUMMARY TABLE

Exemption	Regulatory Citation
Conditionally exempt small quantity generators	40 CFR 261.5
RCRA Empty Containers	40 CFR 261.7
Satellite accumulation units	40 CFR 262.34(c)
Small quantity generators - a generator who generates less than 1,000 kg of hazardous waste in a calendar month (40 CFR 260.10).	40 CFR 262.34(d) and
Farmers disposing of wastes and pesticides	40 CFR 264.1(g)(4) and 265.1(c)(8)
Totally enclosed treatment units - a facility for the treatment of hazardous waste which is directly connected to an industrial production process and which is constructed and operated in a manner which prevents the release of any hazardous waste or any constituent thereof into the environment during treatment (260.10).	40 CFR 264.1(g)(5) and 265.1(c)(9)
Wastewater treatment units - a device which: (1) is part of a wastewater treatment facility that is subject to regulation under either section 402 or 307(b) of the Clean Water Act; and (2) receives and treats or stores an influent wastewater that is a hazardous waste as defined in 261.3, or that generates and accumulates a wastewater treatment sludge that is a hazardous waste as defined in 261.3 of this chapter, or treats or stores a wastewater treatment sludge which is a hazardous waste as defined in 261.3	40 CFR 264.1(g)(6) and 265.1(c)(10)
Elementary neutralization units - a device which: (1) is used for neutralizing wastes that are hazardous only because they exhibit the corrosivity characteristic defined in 261.22 or they are listed in subpart D of part 261; and (2) meet the definition of tank, tank system, container, transport vehicle or vessel (260.10).	40 CFR 264.1(g)(6) and 265.1(c)(10)
Emergency or spill management units	264.1(g)(8) and 265.1(c)(11)
Transporters storing manifested hazardous wastes at transfer facilities	264.1(g)(9) and 265.1(c)(12)
Containers to which absorbent material is added to the waste (or visa versa) the first time the waste is added to the container	264.1(g)(10) and 265.1(c)(13)
Universal waste handlers and transporters - person engaged in the off-site transportation of universal waste by air, rail, highway or water (260.10).	264.1(g)(11) and 265.1(c)(14)

2.7 Waste Determination Considerations

Appropriate knowledge of the concentration of organic constituents in the hazardous waste that is managed at a facility is essential to making Subparts AA, BB, and CC compliance determinations. Subpart AA standards apply to certain process vents that manage hazardous wastes with organic concentrations of at least 10 parts per million by weight (ppmw). Subpart BB standards apply to equipment that comes in contact with waste streams that contain 10 percent by weight or greater total organics. Subpart CC standards require that appropriate control be used for air emissions from tanks, surface impoundments, containers and miscellaneous units that manage hazardous waste containing at least 500ppmw volatile organic constituents.

RCRA Air Standard	Affected Equipment	Regulatory Level of Concern
Subpart AA	Process Vents	10 parts per million by weight
Subpart BB	Equipment Leaks	10 percent by weight
Subpart CC	Tanks, Surface Impoundments, and Containers	500 parts per million by weight

For each of the Subparts AA, BB, and CC standards, controls generally are required if the equipment that is subject to the rule manages waste with organics concentrations at the point of generation equal to or greater than the regulatory level of concern presented in the standard. Specific waste determination requirements, control requirements, and recordkeeping requirements for each of the standards are described below in Sections 3.0, 4.0, and 5.0.

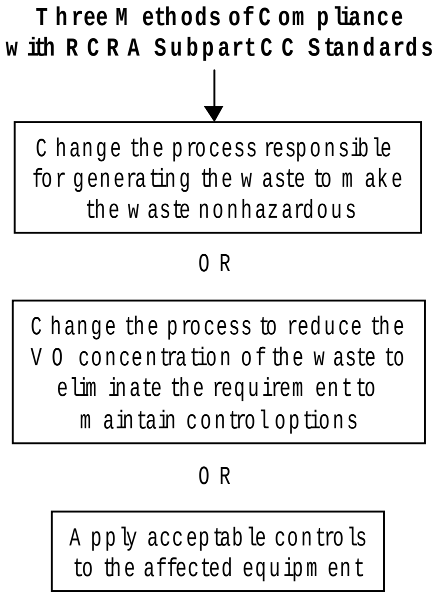
Subparts AA, BB, and CC standards allow for organics concentrations in the hazardous waste to be determined either by direct measurement (i.e., sampling and analysis) or by applying process knowledge. If direct measurement is used, the sampling must be conducted under a written sampling plan and the samples must be analyzed by one of the analytical methods described in the applicable standard using an appropriate quality assurance program. If process knowledge is used, documentation is required which gives the basis for the process knowledge. Process knowledge documentation may include sources such as manifests, shipping papers, waste certification notices, material balances or compound-specific test data from previous testing at the hazardous waste unit or from other similar processes at other units may be used.

T*he exemptions for the CAA, mixed waste and other overlapping regulations with the RCRA Organic Air Standards are not clear cut and require investigation to ensure that the hazardous waste management units are using air emission controls and are in compliance with fugitive air emission requirements and limits directly applicable to the unit and the control of volatile organics.*

2.8 Compliance Options Overview

Compliance with the RCRA air standards may be achieved by three basic methods:

- Change the process which is responsible for generating the waste to make the waste nonhazardous;
- Change the process that is used at the facility to reduce the volatile organics concentration of the waste below levels which require maintenance of control options; or
- Apply acceptable controls to all affected equipment.



As the RCRA air standards apply only to hazardous wastes, rendering the waste nonhazardous prior to its reaching certain equipment would exempt the unit from the standards. For example, elementary neutralization is a treatment method that can be performed to wastes which exhibit only the hazardous waste characteristics of corrosivity making them nonhazardous. Other process changes may be possible for characteristic hazardous wastes make them nonhazardous characteristic. For hazardous waste with very high concentrations of volatile organics, the volatile organic themselves may be responsible for the classification of the waste as hazardous and some other appropriate treatment option may be required.

Changing the process that is used at the facility to reduce the volatile organics concentration of the waste may be possible. Changes in material usage or changes in distillation, stripping, extraction, or crystallization process conditions may be used to lower the waste’s VO content to below the regulatory level at the point of origination. Treatment by one of these methods may eliminate the need to maintain control requirements on units which exist downstream of the treatment. Additional discussion of waste treatment and it’s effects on the control requirements needed for units at a facility are provided in the appropriate sections below.

Other compliance strategies may be based on the particular applicability requirements that are presented in the Subparts AA, BB, and CC standards. One possible strategy could be to make other process changes of waste minimization steps so that the regulatory status of facility would be a small quantity generator or conditionally exempt small quantity generator. Another strategy could be to treat the hazardous waste to an exempt unit (e.g., WWTU). The applicability information provided in each of the sections below is useful for designing compliance strategies.

3.0 SUBPART AA STANDARDS

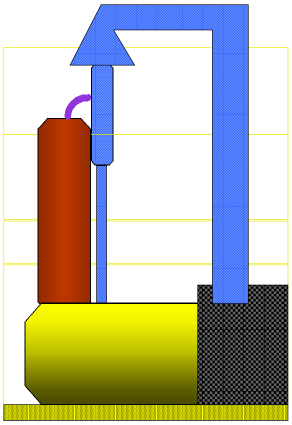
Tip:
Must confirm waste concentration annually

These regulations apply to process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction or air or steam stripping operations that manage hazardous wastes with organic concentrations of at least 10 ppmw. The owner or operator with process vents associated with one of the processes above must reduce total organic emissions from affected process vents at the facility below 1.4 kg/h (3 lb/h) and 2.8 Mg/yr (3.1 tons/yr) or reduce, by use of a control device, total organic emissions from all affected process vents at the facility by 95 weight percent.

3.1 **Closed-Vent Systems** (264.1033(k) and 265.1033(k))

EPA Method 21 and other methods referenced in this handbook are available on the World Wide Web @ http://www.epa.gov/ttn/emc/promgate.html.

A closed-vent system is defined as a system that is not open to the atmosphere and that is composed of piping, connections, and, if necessary, flow-inducing devices that transport gas or vapor from a piece or pieces of equipment to a control device. Subpart AA standards require that closed-vent systems operating under positive pressure must be designed and operated with no detectable emissions. No detectable emissions is determined using Method 21 in 40 CFR 60 Appendix A and is achieved by an instrument reading of less than 500 ppm above background. Closed-vent systems operating under negative pressure must be equipped with a pressure measurement device which is monitored to verify that negative pressure is maintained in the system.



On or before the date a closed-vent system becomes subject to Subpart AA requirements (i.e., begins transporting gas or vapor to a control device) all portions of the closed-vent system must be monitored according to Method 21 to demonstrate that the system operates with no detectable emissions. All components of the closed-vent system and connections such as joints, seams, flanges, and welds must be visually inspected and monitored using Method 21. Visible cracks, gaps, holes, and loose connections are some examples of defects which would need repair. Following the initial leak detection, all portions of the closed-vent system must be monitored again at least once per year, or at any time the Regional Administrator requests, unless portions of the closed-vent system are determined to be unsafe to monitor.

Defects detected during monitoring must be repaired as soon as practicable, but no later than 15 calendar days after detected. A first attempt at repair must be made no later than five calendar days after the emission is detected. Following the first attempt at repair, a delay of repair allowance is provided for equipment that can not reasonably be fixed within 15 days without a process unit shutdown. If the owner or operator determines that the repair can not reasonably be fixed without a process unit shutdown, the repair must take place by the end of the next process unit shutdown.

If the owner or operator determines that any component of a closed-vent system is unsafe to monitor because monitoring personnel would be exposed to an immediate danger by conducting monitoring that component of the closed-vents system may be exempt from the annual monitoring requirements. However, the owner or operator must adhere to a written plan that requires monitoring the closed-vent system components as frequently as possible during safe-to-monitor times.

3.2 **Control Devices** (264.1033(b)-(j) and 265.1033(b)-(j))

The following are descriptions of the control device requirements included in the Subpart AA standards. These control devices must be installed, calibrated maintained and operated according to the manufacturers specifications. They also must be operating at all times when emissions may be vented to them.

3.2.1 **Vapor Recovery Devices such as Condensers and Carbon Adsorption Systems** (264.1033(b) and 265.1033(b))

A control device involving vapor recovery must be designed and operated to recover the organic vapors vented to it with an efficiency of 95 weight percent or greater. This requirement must be maintained unless the total organic emission for all of the affected process vents at the facility can be maintained at less that 1.4 kg/h and 2.8 Mg/yr if the vapor recovery device is operating at an efficiency less than 95 weight percent. The owner or operator must install, calibrate, maintain and operate according to the manufacturer's specifications a flow indicator that provides a record of vent stream flow from each affected process vent to the control device at least once every hour. The flow indicator sensor must be installed in the vent stream at the nearest feasible point to the control device inlet but before the point at which the vent streams are combined.

If a condenser is used, the owner or operator has two choices to monitor the unit. One option is to use an organics concentration monitoring device equipped with a continuous recorder to measure the concentration of the organic compounds in the exhaust vent stream from the condenser. Another option is to install a temperature monitoring device equipped with a continuous recorder. The temperature monitoring device must be installed at a location in the exhaust vent stream from the condenser. The temperature monitoring device must operate with an accuracy of + 1 percent of the temperature being monitored in $_{o}$C or + 0.5 $_{o}$C. The facility owner or operator must demonstrate through the results of the monitoring that the condenser is being operated according to the manufacturers specifications to achieve the necessary operating efficiency.

"All carbon that is hazardous waste that is removed from a carbon adsorption system must be managed appropriately."

When a carbon adsorber is used the owner or operator must monitor the unit to determine when breakthrough has occurred. If the unit is a fixed-bed carbon adsorber, the owner or operator has two options for monitoring. One is to install a continuous record to monitor the organic concentration in the exhaust vent stream from the carbon bed. The other option is to install a monitoring device equipped with a continuous recorder to measure a parameter that indicates the carbon bed is regenerated on a regular predetermined time cycle. One parameter that may be measured is the organic concentration of the effluent from the adsorber. An increase in organic concentration would reveal breakthrough has occurred. The owner or operator must inspect the readings from each monitoring device at least once each operating day to insure that the control device is operating properly.

A carbon adsorption system such as a carbon canister that does not regenerate the carbon bed directly onsite in the control device must replace the existing carbon in the control device with fresh carbon on a regular basis using one of two options. The first option is to monitor the concentration level of the organic compounds in the exhaust vent stream from the carbon adsorption system on a regular schedule and replace the existing carbon with fresh carbon immediately when carbon breakthrough is indicated. The monitoring frequency is required to be daily or at an interval no greater than 20 percent of the time required to consume the total carbon working capacity, whichever is greater. The second option is to replace the existing carbon with fresh carbon at a regular, predetermined time interval that is less than the design carbon replacement interval.

Refer to Overview of Subparts AA and BB presentation from the March 2002 EPA Region 4 RCRA Organic Air Emissions Permit and Compliance Training for additional information on these regulations.

All carbon that is hazardous waste that is removed from a carbon adsorption system must be managed appropriately. The carbon may be treated thermally in a permitted thermal treatment unit, a unit that is operating in accordance with the Subpart H, or a unit that is operating in compliance with Subparts AA and CC standards. Records must be maintained to demonstrate that the carbon that is hazardous waste that is removed from the carbon adsorption system was disposed of in an appropriate manner.

3.2.2 **Flares** (264.2033(d) and 265.1033(d))

A flare used to comply with the Subpart AA regulations can be steam-assisted, air-assisted or nonassisted. A flare must be designed for and operated with no visible emissions as determined by Method 22 which is found in 40 CFR Appendix A. Method 22 requires that there to be no visible emissions except for periods not to exceed a total of five minutes during any two consecutive hours. The flare must be operated with a flame present at all times, as determined by the use of a heat sensing monitoring device equipped with a continuous recorder that indicates the continuous ignition of the pilot flame. The owner or operator must install, calibrate, maintain, and operate according to the manufacturer's specifications a flow indicator that provides a record of vent stream flow from each affected process vent to the control device at least once every hour. The flow indicator sensor must be installed in the vent stream at the nearest feasible point to the control device inlet but before the point at which the vent streams are combined.

EPA Method 22 and other EPA methods are available on the World Wide Webb @ http://www.epa.gov/ttn/emc/promgate.html.

The flare may only be used if the net heating value of the gas being combusted is 11.2 MJ/scm (300 Btu/scf) or greater, if the flare is steam-assisted or air-assisted. The flare can operate with the net heating value of the gas being combusted is 7.45 MJ/scm (200 Btu/scf) or greater if the flare is nonassisted. The net heating value of the gas being combusted must be determined using the following equation:

$$H_T = K[\sum_{i=1}^{n} C_i H_i] \qquad \text{(Equation 3-1)}$$

where: H_T = Net heating value of the sample, in MJ/scm; where the net enthalpy per mole of off gas is based on combustion at 25 °C and 760 mm Hg, but the standard temperature for determining the volume corresponding to 1 mol is 20 °C

K = Constant, $1.74\text{x}10^{-7}$ (1/ppm) (g mol/scm) (MJ/kcal) where standard temperature for (g mol/scm) is 20 °C

C_i = Concentration of sample component i in ppm on a wet basis, as measured for organics by Reference Method 18 in 40 CFR part 60 and measured for hydrogen and carbon monoxide by ASTM D 1946-82

H_i = Net heat of combustion of sample component i in kcal/g mol at 25 $_o$C and 760 mmHg. The heats of combustion may be determined using ASTM D 2382-83 if published values are not available or cannot be calculated.

A steam-assisted or nonassisted flare shall be designed for and operated with an exit velocity of less than 18.3 m/s (60 ft/s). If the net heating value of the gas being combusted is greater than 37.3 MJ/scm (1,000 Btu/scf), a steam-assisted or nonassisted flare may be designed for and operated with an exit velocity equal to or greater than 18.3 m/s but must be less than 122 m/s. The exit velocity shall be determined by dividing the volumetric flow rate (in units of standard temperature and pressure), as determined by Reference Methods 2, 2A, 2C, or 2D in 40 CFR Appendix A as appropriate, by the unobstructed cross-sectional area of the flare tip.

A steam-assisted or nonassisted flare which is designed for and operated with an exit velocity, less than the velocity V_{max}, and less than 122 m/s is allowed. The maximum allowed velocity, V_{max}, is determined by the following equation:

$$\mathrm{Log}_{10}(V_{max}) = (H_T + 28.8)/31.7$$

(Equation 3-2)

where: H_T = The net heating value
28.8 = constant
31.7 = constant

An air-assisted flare shall be designed and operated with an exit velocity less than the velocity, V_{max}. The maximum allowed velocity, V_{max}, for an air-assisted flare shall be determined by the following equation:

$$V_{max} = 8.706 + 0.7084\,(H_T)$$

(Equation 3-3)

where: 8.706 = constant
0.7084 = constant
H_T = The net heating value

3.2.3 Enclosed Combustion Devices such as Vapor Incinerators, Boilers, and Process Heaters

(264.1033(c) and 265.1033(c))

Examples of enclosed combustion devices include thermal vapor incinerator, catalytic vapor incinerator, boiler and process heater. Enclosed combustion devices must be operated to achieve one of the following three conditions: i) reduce the organic emissions vented to it by 95 weight percent or greater;

ii) achieve a total organic compound concentration of 20 ppmv, expressed as the sum of actual compounds, not carbon equivalents, on a dry basis corrected to 3 percent oxygen; or, iii) provide a minimum residence time of 0.5 seconds at a minimum temperature of 760 °C. The owner or operator must install, calibrate, maintain and operate according to the manufacturer's specifications a flow indicator that provides a record of vent stream flow from each affected process vent to the control device at least once every hour. The flow indicator sensor must be installed in the vent stream at the nearest feasible point to the control device inlet but before the point at which the vent streams are combined.

These EPA Methods are available on the World Wide Webb @ http://www.epa.gov/ttn/emc/promgate.html.

If a thermal vapor incinerator is used as a control device, the incinerator must have a temperature monitoring device equipped with a continuous recorder installed at a location in the combustion chamber downstream of the combustion zone. The temperature monitoring device must have an accuracy of + 1 percent of the temperature being monitored in °C or + 0.5 °C, whichever is greater. Catalytic vapor incinerators are required to have a temperature monitoring device meeting these same requirements installed at two locations. One location must be in the vent stream feeding the unit at the nearest feasible point to the catalyst bed inlet. The other location must be in the vent stream at the nearest feasible point to the catalyst bed outlet.

If a boiler or process heater is used to destroy the organics in a waste stream, the boiler or process heater must be designed such that the vent stream from the closed-vent system is introduced directly into the flame combustion zone of the boiler or process heater. If the boiler or process heater has a design capacity less than 44 MW, a temperature monitoring device equipped with a continuous recorder must be installed at a location in the furnace downstream of the combustion zone. The temperature monitoring device shall have an accuracy of + 1 percent of the temperature being monitored in °C or +0.5 °C, whichever is greater. If the boiler or process heater has a design capacity greater than or equal to 44 MW, an appropriate monitoring device such as a continuous monitor of the organic concentration of the effluent equipped with a continuous recorder must be installed on the equipment to indicate that good combustion operating practices are being used. All monitoring devices must be installed, calibrated, operated and maintained according to the manufacturers specifications.

3.2.4 Other Control Devices
(264.1033(j) and 265.1033(j))

Control devices other than a thermal vapor incinerators, catalytic vapor incinerators, flares, boilers, process heaters, condensers, or carbon adsorption systems also may be used to destroy organics from process vents that are subject to the Subpart AA standards. The owner or operator of these other control devices must develop documentation which contains sufficient information to identify the control device as capable of operating in conformance with the Subpart AA standards (i.e., operates to destroy organics), to describe the proper operation of the control device and to identify the process parameter(s) that indicate proper operation and maintenance of the control device.

3.3 Waste Determinations

3.3.1 Waste Determination to Determine Applicability of Subpart AA Standards
(264.1034(c) and 265.1034(c))

In order to show that a process vent associated with a hazardous waste distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operation is not subject to the Subpart AA standards, the owner or operator must make an initial determination that the time-weighted, annual average total organic concentration of the waste managed by the waste management unit is less than 10 ppmw. The owner or operator may use either direct measurement or process knowledge.

If direct measurement is used to prove the organic concentration is less than 10 ppmw, the owner or operator must collect a minimum of four grab samples of waste for each waste stream managed in the affected unit. The samples must be collected under process conditions which would be expected to cause the maximum waste organic concentration.

SW-846 Methods are available on the World Wide Webb at http://www.epa.gov/epaoswer/hazwaste/test/9060.pdf or http://www.epa.gov/epaoswer/hazwaste/test/8260b.pdf

If the waste is generated onsite, the four grab samples must be collected at a point before the waste is exposed to the atmosphere. If the waste is generated offsite, the grab samples must be collected at the inlet to the first waste management unit that receives the waste provided the waste has been transferred to the facility in a closed system and the waste is not diluted or mixed with other waste. Each sample must be analyzed either by SW-846 Method 9060 or SW-846 Method 8260.

The arithmetic mean of the results of the analyses of the four samples must apply to each waste stream managed in the unit in determining the time-weighted, annual average total organic concentration of the waste. The time-weighted average is to be calculated using the annual quantity of each waste stream processes and the mean organic concentration of each waste stream managed in the unit.

If process knowledge of the waste is used to determine that its total organic concentration is less than 10 ppmw, documentation of the waste determination is required. One example of documentation that shall be used to support a determination under this provision include production process information documenting that no organics are used. Another example is information that the waste is generated by a process at the same or another facility that has previously demonstrated by direct measurement to generate a waste having a total organic content less than 10 ppmw. A third example is prior speciation analysis results on the same waste stream where it can also document that no process changes have occurred since that analysis that could affect the waste total organic concentration.

Sampling and analysis to demonstrate that a hazardous waste managed by a process vent has organic concentrations less than 10 ppmw must be conducted by the date the waste is first managed in a waste management unit. If the waste is continuously generated, the waste determination must be conducted annually. A determination is also required any time there is a change in the waste managed or a change in the process that generates or treats the waste.

When the owner or operator and the Regional Administrator do not agree on whether an affected unit manages a hazardous waste with organic concentrations of at least 10 ppmw based on the knowledge of the waste, the analysis of an appropriate sample of the waste with SW-846 Method 8260 is used to resolve the dispute.

3.3.2 Demonstrating Compliance with Performance Standards (264.1034 and 265.1034)

Determinations of process vent emissions and reductions of total organic compound concentrations achieved by control devices may be based on engineering calculations or performance tests. If performance tests are used to determine total organic compound concentrations, vent emissions, or emission reductions, the performance tests must conform with the requirements outlined in 40 CFR 264.1034 and 265.1034.

EPA Method 21 and other EPA methods are available on the World Wide Webb @ http://www.epa.gov/ttn/emc/promgate.html.

Testing of a closed-vent system to demonstrate no detectable emissions shall comply with the following requirements: Monitoring shall comply with Method 21; the detection instrument shall meet the performance criteria of Method 21; the instrument shall be calibrated before use on each day of its use by the procedures specified in Method 21; the calibration gases shall be zero air (less than 10 ppm of hydrocarbon in air and a mixture of methane or n-hexane) and air at a concentration of approximately, but less than, 10,000 ppm methane or n-hexane. The instrument probe must be transversed around all potential leak interfaces as close to the interface as possible as described in Method 21; the arithmetic difference between the maximum concentration indicated by the instrument and the background level is compared with 500 ppm for determining compliance.

"Information required for the performance tests include total organic compound concentrations and mass flow rates entering and exiting control devices."

Performance tests may be used to determine whether a facility is meeting the requirement of maintaining total organic air emissions from affected process vents below 1.4 kg/h and 2.8 Mg/yr and, in the case of enclosed combustion devices, achieving a total organic compound concentration limit of 20 ppm. Information required for the performance tests include total organic compound concentrations and mass flow rates entering and exiting control devices. Method 2 in 40 CFR Part 60, Appendix A shall be used for velocity and volumetric flow rate. Method 18 in 40 CFR Part 60, Appendix A shall be used for determinations of organic concentrations. It is the owner or operators responsibility to assure that appropriate sampling ports, safe sampling platforms, safe access to sampling platforms and utilities necessary for the implementation of these methods are available during the performance tests.

Each performance test must consist of three separate runs. Each run must be conducted for at least 1 hour under the conditions that exist when the hazardous waste management unit is operating at the highest load or capacity level reasonably expected to occur. If the owner or operator takes any action that would result in an increase of total organic emissions from affected process vents at the facility, then a new determination "e.g., performance test" would be required.

For the purpose of determining total organic compound concentrations and mass flow rates, the average of results of all runs must apply. If, due to reasons beyond the owner's or operator's control, one of the three runs does not yield acceptable results, the Regional Administrator may approve using the average of only two runs. The average must be computed on a time-weighted basis. Total organic mass flow rates shall be determined by the following equation:

$$E_h = Q_{sd} \left\{ \sum_{i=1}^{n} C_i \, MW_i \right\} [0.0416][10^{-6}]$$

(Equation 3-4)

where: E_h =Total organic mass flow rate in kg/h
Q_{sd} =Volumetric flow rate of gases entering or exiting control device, as determined by Method 2 in dscm/h
n = Number of organic compounds in the vent gas
C_i = Organic concentration in ppm, dry basis, of compound i in the vent gas, as determined by Method 18
MW_i = Molecular weight of organic compound I in the vent gas in kg/kg-mol
0.0416= Conversion factor for molar volume in kg-mol/m^3 (@ 293 K and 760 mm Hg);
10^{-6} = Conversion from ppm in ppm^{-1}

The annual total organic emission rate must be determined by the following equation:

$$E_A = (E_h)(H)$$

(Equation 3-5)

where: E_A =Total organic mass emission rate in kg/y
E_h = Total organic mass flow rate for the process vent in kg/h
H =Total annual hours of operations for the affected unit in h.

Total organic emissions from all affected process vents at the facility must be determined by summing the hourly total organic mass emission rates and by summing annual total organic mass emission rates for all affected process vents at the facility.

"The owner or operator must record such process information as may be necessary to determine the conditions of the performance tests."

The owner or operator must record such process information as may be necessary to determine the conditions of the performance tests. This information may include operating temperature, flow rate, or pressure. Operations during periods of startup, shutdown, and malfunction can not constitute representative conditions for the purpose of a performance test.

When an owner or operator chooses to use test data to determine the organic removal efficiency or total organic compound concentration achieved by the control device, a performance test plan is required. This test plan must include a description of how the planned test is going to be conducted when the hazardous waste management unit is operating at the highest load or capacity level reasonably expected to occur. This must include the estimated or design flow rate and organic content of each vent stream and a definition of the acceptable operating ranges of key process and control device parameters during the test program.

3.4 Recordkeeping Requirements (264.1035 and 265.1035)

Records must be kept which identify all affected process vents and provide data and information on the annual throughput and operating hours of each affected unit, estimated emission rates for each affected vent, estimated emission rates for the overall facility and the approximate location of each vent within the facility. Information and data on waste determinations, performance test plans, and emission reductions achieved by add-on control devices based on engineering calculations or sources tests must also be maintained. Documentation supporting compliance with the Subpart AA emissions limits must include a list of the references and sources that were used to prepare the documentation. If performance tests are used to demonstrate compliance, all test results must be provided.

Owners or operators using a closed-vent system and/or control device must include a detailed engineering description of the system in the facility operating record. The records must include the manufacturer's name and the model number of each control device, the type of control device, the dimensions of the control device, the capacity, and the construction materials. Records, including the dates of each compliance test must also be kept.

The owner or operator of more than one hazardous waste management unit subject to Subpart AA standards may comply with the recordkeeping requirements for these hazardous waste management units in one recordkeeping system if the system identifies each record by each hazardous waste management unit. All records must be maintained by the owner or operator for at least three years. The records may be kept either in a hard copy format or electronically and the records should be easily accessible during inspections.

Design documentation and monitoring, operating, and inspection information for each closed-vent system and control device required to comply with the provisions of this part must be included and kept up-to-date in the facility operating record. This information must include a description and date of each modification that is made to the closed-vent system or control device design. Identification of each operating parameter, description of each monitoring device, and diagram of each monitoring sensor location is required. Additional information to be provided include monitoring, operating, inspection information, records of date, time and duration of each period when any monitored parameter exceeds the value established in the control device design analysis.

Information regarding APTI Course 415: Control of Gaseous Emissions and other APTI courses can be obtained at http://www.epa.gov/oar/oaqps/eog/

If engineering calculations are used to support compliance with Subpart AA standards, the calculations should include information such as a design analysis, speculations, drawings, schematics, and piping and instrumentation diagrams based on the appropriate sections of "APTI Course 415: Control of Gaseous Emissions" or other engineering texts acceptable to the Regional Administrator that present basic control device design information. Documentation provided by the control device manufacturer or vendor that describes the control device design should also be kept in the facility records. The design analysis must address the vent stream characteristics and control device operation parameters.

- For a thermal vapor incinerator, the design analysis must consider the vent stream composition, constituent concentrations, and flow rate. The design analysis must also establish the design minimum and average temperature in the combustion zone and the combustion zone residence time.

- For a catalytic vapor incinerator, the design analysis must consider the vent stream composition, constituent concentrations, and flow rate. The design analysis must also establish the design minimum and average temperature across the catalyst bed inlet and outlet.

- For a boiler or process heater, the design analysis must consider the vent stream composition, constituent concentrations and flow rate. The design analysis must also establish the design minimum and average flame zone temperatures, combustion zone residence time, and description of method and location where the vent stream is introduced into the combustion zone.

- For a flare, the design analysis must consider the vent stream composition, constituent concentrations and flow rate. The design analysis must also consider the other design and operating requirements for a flare as specified in 40 CFR 264.1033(d) and 265.1033(d).

- For a condenser, the design analysis must consider the vent stream composition, constituent concentrations, flow rate, relative humidity and temperature. The design analysis must also establish the design outlet organic compound concentrations, flow rate, relative humidity, and temperature. The design analysis must also establish the design outlet organic compound concentration level, design average temperature of the condenser, exhaust vent stream, and design average temperatures of the coolant fluid at the condenser inlet and outlet.

- For a carbon adsorption system such as a fixed-bed adsorber that regenerates the carbon bed directly onsite in the control device, the design analysis must consider the vent stream composition, constituent concentrations, flow rate, relative humidity, and temperature. The design analysis must also establish the design exhaust vent stream organic compound concentration level, number and capacity of carbon beds, design total steam flow over the period of each complete carbon bed regeneration cycle, duration of the carbon bed steaming and cooling/drying cycles, design carbon bed temperature after regeneration, design carbon bed regeneration time, and design service life of carbon.

- For a carbon adsorption system such as a carbon canister that does not regenerate the carbon bed directly on-site in the control device, the design analysis must consider the vent stream composition, constituent concentrations, flow rate, relative humidity, and temperature. The design analysis must also establish the design outlet organic concentration level, capacity of carbon bed, type and working capacity of activated carbon used for carbon bed, and design carbon replacement interval based on the total carbon working capacity of the control device and source operating schedule.

A statement must be included in the facility operating record that is signed and dated by the owner or operator certifying that the operating parameters used in the design analysis reasonably represent the conditions that exist when the hazardous waste management unit is or would be operating at the highest load or capacity level reasonably expected to occur. Another statement that must be included in the facility operating record, signed and dated by the owner or operator, is a statement certifying that the control devices in use at the facility are designed to operate at an efficiency of 95 percent or greater unless the total organic concentration limit is achieved at an efficiency less than 95 weight percent or the total organic emission limits for affected process vents at the facility can be attained by a control device involving vapor recovery at an efficiency less than 95 weight percent. A statement provided by the control device manufacturer or vendor certifying that the control equipment meets the design specifications may be used to comply with this requirement.

A detailed description of sampling and monitoring procedures, including sampling and monitoring locations in the system, the equipment to be used, sampling and monitoring frequency and planned analytical procedures for sample analysis must also be included in the operating record.

The owner or operator designating any components of a closed-vent system as unsafe to monitor must record in a log that is kept in the facility operating record the identification of closed-vent system components that are designated as unsafe to monitor, an explanation for each closed-vent system component stating why the closed-vent system component is unsafe to monitor, and the plan for monitoring each closed-vent system component.

When a leak is detected in the closed-vent system, the instrument identification number and the closed-vent system component identification number must be recorded along with the operator name, initials or identification number. The date the leak was repaired, the date of first attempt to repair the leak and the date of successful repair of the leak must also be recorded. The maximum instrument reading measured by Method 21 of 40 CFR part 60, Appendix A after it is successfully repaired or determined to be nonrepairable must also be recorded. If a repair was not completed within 15 calendar days, the reason for delay must be recorded. The owner or operator must have a written procedure that identifies the conditions that justify a delay of repair. In such cases, reasons for delay may be documented by citing the relevant section of the written procedure.

3.5 Reporting Requirements

Reporting requirements exist for permitted facilities which are subject to Subpart AA standards. A semiannual report which identifies the facility by EPA identification number, facility name, and facility address must be submitted to the Regional Administrator. For each month during the semiannual reporting period that a control device exceeded or operated outside of requirements of the Subpart AA standards, the report must describe the duration and cause of the exceedance and any corrective action that was taken. If no control devices exceeded or operated outside of the requirements of the Subpart AA standards, no report is necessary.

3.6 Implementation Issues Associated with the Subpart AA Regulations

To view the "Overview of the Subpart AA, BB and CC Regulations" presentation from the EPA Region 4 RCRA Organic Air Emission Standards Permit and Compliance Training.

T*est your knowledge of the Subpart AA regulations using the Subpart AA Case Study.*

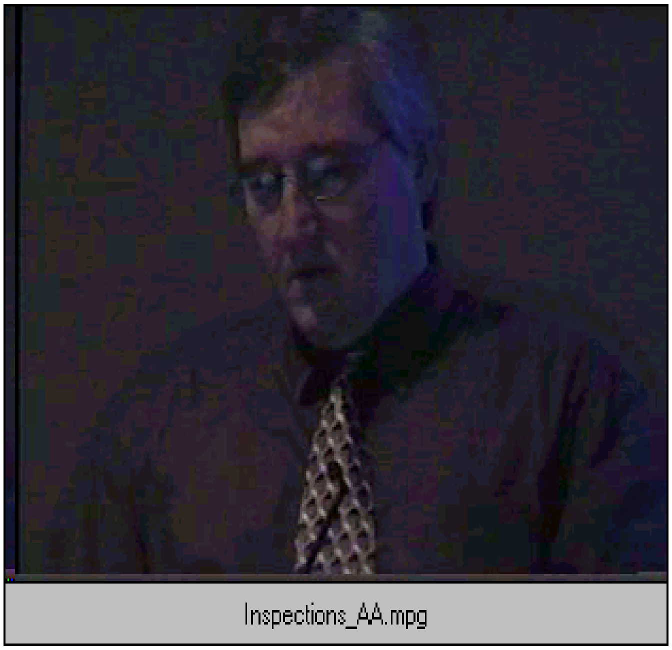
Subpart AA applies specifically to process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air/steam stripping operations subject to a permit. Because of the recycling provisions, operations such as the distillation of hazardous waste at generator facilities are generally exempt from permitting, with the practical effect that Subpart AA is generally only applicable at TSD facilities. While the applicability of Subpart Aa is limited, it is important to note that subsequent requirements of Subparts BB and CC refer back to the control device standards of Subpart AA.

One of the issues that has arisen in recent years is the issue of whether groundwater treatment units are subject to the RCRA organic air emission standards. Many believe that air strippers fall under the wastewater treatment unit exemption outlined in 40 CFR §264.1(g)(6). The June 21, 1990 preamble to the RCRA Subpart AA & BB Rule does make reference to wastewater treatment tanks as defined under 40 CFR § 260.10 being excluded from applicabilityto these two Subparts. But, this is not the case when remediating groundwater in air stripping operations. 40 CFR §260.10 defines wastewater treatment units as receiving or treating an influent wastewater that is classified as hazardous waste as defined in 40 CFR §261.3. However, 40 CFR §261.3 does not address environmental media such as groundwater. Environmental media are not solid wastes. The Agency's position is that mixtures of environmental media and listed hazardous wastes must be managed **as if** they were hazardous wastes, an interpretation other words referred to as the "contained-in" policy and upheld in Federal court (ref. Chemical Waste Management Inc. v. U.S. EPA, 869 F.2d 1526; D.C. Cir. 1989). In summary, groundwater is not a hazardous waste and does not meet the criteria of 40 CFR §261.3. Thus, an air stripper treating groundwater contaminated with volatile organic compounds does not meet the definition of a wastewater treatment unit as mentioned in the 1990 preamble to the Subpart AA & BB Rule and is not excluded from applicability to the RCRA Organic Air Emission Standards. In accordance with the "Contained-in Policy", a corrective action unit treating groundwater contaminated with a listed hazardous waste should be addressed as a hazardous waste management unit - not as a wastewater treatment unit.

By statute, air emissions (as well as other environmental media releases) from units managing hazardous wastes with interim status, are subject to corrective action under 3008(h) authority. The statute requires environmental media contamination resulting from waste management be addressed to protect human health and the environment. Subpart AA & BB were promulgated under HSWA authority mandated by Section 3004(n) of the Solid Waste Disposal Act (refer to the June 21, 1990 FR 25456, Section III, C. Air Standards Under RCRA Section 3004(n)). Section 3004(n) requires the monitoring and control of air emissions at units treating, storing or disposing of hazardous wastes as necessary to protect human health and the environment.

Conducting inspections for Subpart AA and identifying violations can also be a complicated process. To conduct a proper inspection, it is critical that a pre-inspection file review is conducted. An inspector should have a clear understanding of the processes expected to be encountered at the facility, and what actions the facility has taken in order to comply with the regulations. To ensure that all requirements are addressed during the inspection, a facility-specific checklist should be developed and used as a guide. A model Subpart AA Inspection Checklist has been developed which may be used as a starting point. Additonal information regarding conducting inspections for Subpart AA and building an enforcement case are provided in the Subpart AA Case Study presented at the EPA Region 4 RCRA Organic Air Emissions Permit and Compliance Training held in March 2002.

To view a video concerning the keys to conducting a Subpart AA inspection click on the highlighted test - Inspections_AA.mpg



4.0 SUBPART BB STANDARDS

RCRA Section 1006(b) requires that RCRA standards be consistent but not duplicative of Clean Air Act standards. Equipment operated with air emission controls in accordance with Clean Air Act requirements under *40 CFR Parts 60 (www.epa.gov/docs/epacfr40/chapt-I.info/60tc.html), 61 (www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_40/40cfr61_00.html), 63 (www.access.gpo.gov/nara/cfr/cfrhtml_00/Title_40/40cfr63_00.html),* are exempt from Subpart BB requirements. Subpart BB standards apply to equipment that contains or contacts hazardous waste with organic concentrations of at least 10 percent by weight. There are specific monitoring and reporting requirements based on the type of equipment. However applicable equipment that contains or contacts hazardous waste for less than 300 hours per calendar year is excluded from the inspection and monitoring requirements of these standards. Closed-vent systems and control devices subject to Subpart BB standards must comply with all applicable Subpart AA standards. Any closed-vent systems and control devices utilized must comply with Subpart AA design, operating, monitoring, and reporting requirements.

Additional information regarding the Subpart BB standards is provided in the "Bathing in BB" presentation from the March 2002 EPA Region 4 RCRA Organic Air Emission Standards Permit and Compliance Training.

4.1 Special Definitions (264.1031)

Subpart BB standards consist primarily of leak detection and repair of design specifications.

Light liquid service is based on the organic content of the liquid. The stream must be a liquid at operating conditions. The vapor pressure of one or more component in the stream must be greater than 0.3 kiloPascals (kPa) at 20°C. The organic component(s) with the vapor pressure greater than 0.3 kPa must be equal to or greater than 20 percent by weight of the stream.

Gas/vapor service is a waste stream that is in the gaseous state at operating conditions.

Heavy liquid service is anything that is not in light liquid service or in gas vapor service.

Connector is a flanged, screwed, welded or other jointed fittings used to connect two pipelines or a pipeline and a piece of equipments. For the purpose of reporting and record keeping, "connector" is further defined as "flanged fittings" that are not covered by insulation; or other materials that prevent location of the fittings.

4.2 Inspection and Monitoring Requirements

4.2.1 Pumps in Light Liquid Service

(264.1052 and 265.1052)

Each pump which is in light liquid service must be monitored monthly in accordance with *Method 21*. An instrument reading of 10,000 ppm or greater determines a leak. Each pump which is in light liquid service must also be checked by visual inspection each calendar week. Visible indications of liquids dripping from a pump seal determines a leak. When a leak is detected the owner or operator must repair it as soon as practicable but no later than 15 calendar days from detection. A first attempt at repair shall be made no later than five calendar days after each leak is detected.

A pump in light liquid service which is equipped with a dual mechanical seal system with a barrier fluid system, is exempt from the Method 21 monitoring requirements if the dual mechanical seal system meets one of three alternatives. These are: (1) the seal system is operated with a barrier fluid at a pressure that is at all times greater than the pump stuffing box pressure; (2) the seal system is equipped with a barrier fluid degassing reservoir that is connected by a closed-vent system to a control device; or (3) the seal system is equipped with a system that purges the barrier fluid into a hazardous waste stream with no detectable emissions to the atmosphere. Regardless of the alternative that is used to meet the requirements of these standards, the barrier fluid system in the dual mechanical seal pump must not be a hazardous waste with organic concentrations 10 percent or greater by weight. Also, each barrier fluid system must be equipped with a sensor that will detect failure of the seal system, failure of the barrier fluid system or both. Each sensor must be checked daily or be equipped with an audible alarm that is checked monthly to ensure that it is functioning properly. The owner or operator is required to visually inspect each pump weekly for indications of liquids dripping from the pump seals.

The owner or operator must determine, based on design considerations and operating experience, the criterion that indicate failure of the seal system and failure of the barrier fluid system. If there are any indications of liquids dripping from the pump seal or the sensor indicates failure of the seal system and/or the barrier fluid system, a leak is detected. When a leak is detected, it must be repaired as soon as practicable but no later than 15 calendar days from detection. A first attempt at repair must be made no later than five calendar days after each leak is detected. Any pump that is designated for no detectable emissions, as indicated by an instrument reading of less than 500 ppm above background is exempt from the visual and instrument monitoring requirements. Delays of repair of equipment for which leak have been detected will be allowed if the repair is technically infeasible without a hazardous waste management unit shutdown. For such instances, the repair must occur before the end of the next hazardous waste management unit shutdown. Delays of repair of equipment for which leaks have been detected are also permitted if the equipment is isolated from the hazardous waste management unit and does not continue to contain or contact hazardous waste with organic concentrations at least 10 percent by weight. Delay of repair for pumps is permitted if the repair requires the use of a dual mechanical seal system that includes a barrier fluid system and the repair is completed as soon as practicable, but no later than six months after the leak was detected.

4.2.2 **Compressors** (264.1053 and 265.1053)

Each compressor subject to Subpart BB regulations must be equipped with a seal system that includes a barrier fluid system that prevents leakage of total organic emissions to the atmosphere. The compressor seal system must meet one of three alternatives; (1) The seal system is operated with the barrier fluid at a pressure that is at all times greater than the compressor stuffing box pressure; (2) the seal system is equipped with a barrier fluid system that is connected by a closed-vent system to a control device; or (3) the seal system purges the barrier fluid into a hazardous waste stream with no detectable emissions to the atmosphere. Regardless of which alternative is used to meet the requirements of these standards, the barrier fluid must not be hazardous waste with organic concentrations 10 percent or greater by weight. Also, each barrier fluid system must be equipped with a sensor that will detect failure of the seal system or the barrier fluid system. Each sensor must be checked daily unless it is equipped with an audible alarm which then requires monthly checks to ensure it is functioning properly.

The owner or operator must determine, based on design considerations and operating experience, a criterion that indicates failure of the seal system or the barrier fluid system. If the sensor indicates failure of seal system or the barrier fluid system a leak is detected.

When a leak is detected, it must be repaired as soon as practicable, but no later than 15 calendar days after it is detected. A first attempt must be made no later than five calendar days after each leak is detected.

Compressors which are equipped with a closed-vent system capable of capturing and transporting leakage from the seal to a control device that complies with the requirements of 40 CFR Section 265.1060 are exempt from the seal system requirement.

A compressor is exempt from the above listed requirements if it is equipped with a closed-vent system capable of capturing and transporting any leakage from the seal to a control device that complies with the control device requirements of 40 CFR 264.1060 and 265.1060

4.2.3 **Pressure Relief Devices in Gas/ Vapor Service** (264.1054 and 265.1054)

Pressure relief devices in gas/vapor service must be operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppm above background as determined by using *Method 21*. The only exception to this is during a pressure release when the device functions according to it's design. After each pressure release, the pressure relief device must be returned to a condition of no detectable emissions, as indicated with an instrument reading of less than 500 ppm above background, as soon as practicable, but no later than five calendar days after each pressure release.

If the pressure relief device is equipped with a closed-vent system which is capable of capturing and transporting leakage from the pressure relief device to a control device, the pressure relief device is exempt from the instrument monitoring requirement.

4.2.4 **Sampling Connecting Ssystems** (264.1055 and 265.1055)

Each sampling connection system must be equipped with a closed-purge, closed-loop, or a closed-vent system. The closed-purge, closed-loop, or closed-vent system must return the purged hazardous waste stream directly to the hazardous waste management process line with no detectable emissions, collect and recycle the purged hazardous waste stream with no detectable emissions to the atmosphere, or be designed and operated to capture and transport all the purged hazardous waste stream to a control device. Sampling connection systems with in-situ sampling are not required to be equipped with a closed-purge, closed-loop, or closed-vent system.

4.2.5 **Open-Ended Valves or Lines** (264.1056 and 265.1056)

All open-ended valves or lines must be equipped with a cap, blind flange, plug or a second valve, to seal the open end at all times except during operations requiring hazardous waste stream flow through the open-ended valve or line. The open-ended valve or line equipped with a second valve must be operated so that the valve on the hazardous waste stream end is closed before the second valve is closed. When a double block and bleed system is being used, the bleed valve or line may remain open during operations that require venting the lines between the block valves but must be closed at all other times.

Inspector's Tip:
Open-ended valves or lines not equipped with a cap, blind flange, plug or a second valve is a common violation.

4.2.6 Valves in Gas/Vapor Service or in Light Liquid Service (264.1057 and 265.1057)

Each valve in gas/vapor or light liquid service must be monitored monthly to detect leaks.

The monthly monitoring requires the use of Method 21. Any reading of 10,00 ppm or greater determines a leak. When a leak is detected, it must be repaired as soon as possible, but no later than 15 calendar days after leak detection. A first attempt at repair must be made within five calendar days of leak detection.

Wastes generated from parts cleaning, degreasing operations, and painting system often contain constituents such as xylene, toluene, acetone, or other pertroleum distillates that are considered "light liquids" based on their relatively high vapor pressure.

Delays of repair of equipment for which a leak has been detected will be allowed if the repair is technically infeasible without a hazardous waste management unit shutdown. For such instances, the repair must occur before the end of the next hazardous waste management unit shutdown. Delays of repair of equipment for which leaks have been detected are also permitted if the equipment is isolated from the hazardous waste management unit and does not continue to contain or contact hazardous waste with organic concentrations at least 10 percent by weight.

Any valve which is designated as unsafe-to-monitor is exempt from the monthly monitoring requirements in accordance with Method 21. However, the owner or operator must follow a written plan that requires monitoring of the valve as frequently as possible. Valves designated as difficult-to-monitor, because they cannot be monitored without elevating the personnel by more than two meters above a support surface, are also exempt from monthly monitoring by Method 21. The owner or operator must follow a written plan that requires monitoring of the valves at least once per calendar year. Delay of repair for valves is permitted if the owner or operator determines that emissions of purged material resulting from immediate repair are greater than the emissions likely to result from delay of repair. Delay of repair beyond a hazardous waste management unit shutdown will be permitted for a valve if a valve assembly replacement is necessary during the hazardous waste management unit shutdown, provided that valve assembly

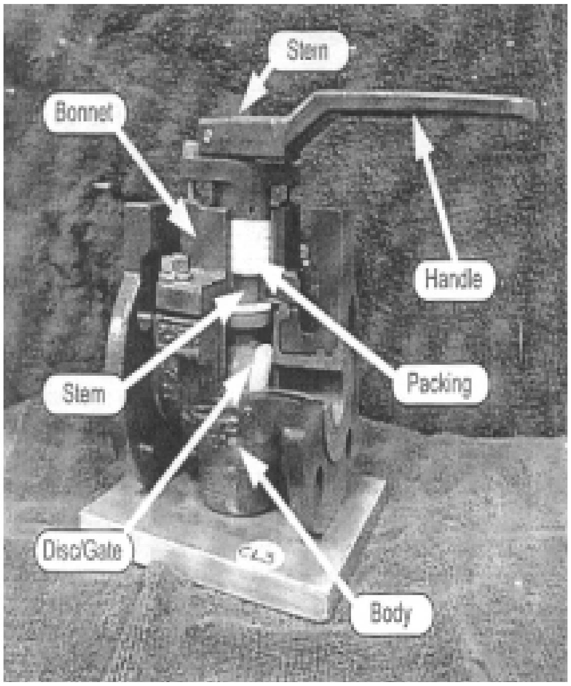


Photo of a typical valve

assembly supplies have been depleted and valve assembly supplies had been sufficiently stocked before the supplies were depleted.

Valves with two successive months without leaks may then conduct quarterly monitoring. Any valve without leak detection for two successive months may be monitored the first month of every succeeding quarter, beginning with the next quarter, until a leak is detected. Once a leak is detected, the owner or operator must return to monthly monitoring until another two successive months have passed without leak detection.

A valve in gas/vapor services which is designated as no detectable emissions and has no external actuating mechanism in contact with the hazardous waste, is exempt from the requirement of monthly monitoring in accordance to Method 21. However, this valve must be tested annually to insure that it is operating as no detectable emissions. The annually test conducted according to Method 21, must indicate that the emissions are less than 500 ppm above background.

4.2.7 Pumps and Valves in Heavy Liquid Service, Pressure Relief Devices in Light Liquid or Heavy Liquid Service and Flanges and Other Connectors (264.1058 and 265.1058)

Pumps and valves in heavy liquid service, pressure relief devices in light liquid or heavy liquid service and flanges and other connectors must be monitored in accordance with Method 21 within five calendar days if a potential leak was identified by visual, audible, olfactory or any other detection method. If the instrument reading is 10,000 ppm or greater, a leak is detected. The leak must be repaired within 15 calendar days, with a first attempt within five calendar days.

Delays of repair of equipment for which leak have been detected will be allowed if the repair is technically infeasible without a hazardous waste management unit shutdown. For such instances, the repair must occur before the end of the next hazardous waste management unit shutdown. Delays of repair of equipment for which leaks have been detected are also permitted if the equipment is isolated from the hazardous waste management unit and does not continue to contain or contact hazardous waste with organic concentrations at least 10 percent by weight. Delay of repair for valves is permitted if the owner or operator determines that emissions of purged material resulting from immediate repair are greater than the emissions likely to result from delay of repair. Delay of repair beyond a hazardous waste management unit shutdown will be permitted for a valve if a valve assembly replacement is necessary during the hazardous waste management unit shutdown, valve assembly supplies have been depleted and valve assembly supplies had been sufficiently stocked before the supplies were depleted. Delay of repair for pumps is permitted if the repair requires the use of a dual mechanical seal system that includes a barrier fluid system and the repair is completed as soon as practicable, but no later than six months after the leak was detected.

Inaccessible, ceramic, or ceramic-lined connectors are exempt from inspection and recordkeeping requirements.

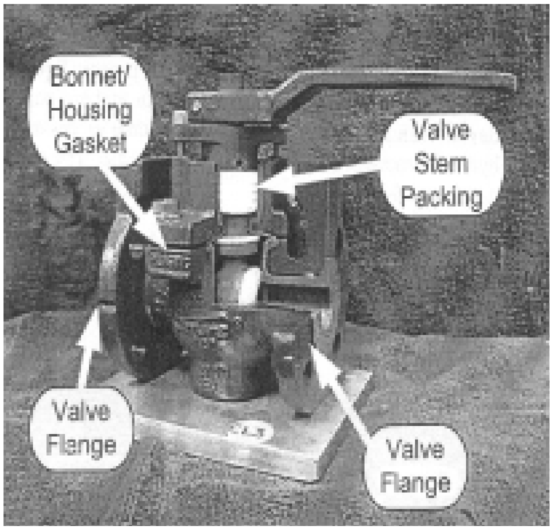
4.3 Alternative Standards for Valves in Gas/vapor or Light Liquid Service: 2 Percent Allowed to Leak (264.1061 and 265.1061)

The owner or operator can elect to have all valves within a hazardous waste management unit comply with an alternative standard which allows no greater than two percent of the valves to leak. The owner or operator must notify the Regional Administrator that they have elected to comply with the alternative standards. A performance test in accordance with Method 21 must be conducted at the time of the notice and annually thereafter. The valves must be monitored within one week by Method 21. If an instrument reading of 10,000 ppm or greater is measured, a leak is detected. The leak percentage must be determined by dividing the number of valves for which leaks are detected by the number of valves subject to the subpart BB standards. If a leak is detected it must be repaired within 15 calendar days, with a first attempt at repair within five calendar days. If the owner or operator decides to no longer comply with the alternative standards section, the Regional Administrator must be notified in writing.

4.4 Alternative Standards for Valves in Gas/vapor or Light Liquid Service: Skip Period (264.1062 and 265.1062)

An owner or operator may choose an alternative standard by which, for all valves in gas/vapor or light liquid service that have had two consecutive quarterly leak detection period with percentages of valves leaking equal to or less than two percent, the owner or operator may skip one of the quarterly leak detection periods. After five consecutive quarterly leak detection periods with the percentage of valves leaking equal to or less than two percent, the owner or operator may go to annually leak detection checks. However, if the percentage of valves leaking is greater than two percent, the owner or operator must resume quarterly monitoring.

Delays of repair of equipment for which leak have been detected will be allowed if the repair is technically infeasible without a hazardous waste management unit shutdown. For such instances, the repair must occur before the end of the next hazardous waste management unit shutdown. Delays of repair of equipment for which leaks have been detected are also permitted if the equipment is isolated from the hazardous waste management unit and does not continue to contain or contact hazardous waste with organic concentrations at least 10 percent by weight. Delay of repair for valves is permitted if the owner or operator determines that emissions of purged material resulting from immediate repair are greater than the emissions likely to result from delay of repair. Delay of repair beyond a hazardous waste management unit shutdown will be permitted for a valve if a valve assembly replacement is necessary during the hazardous waste management unit shutdown, valve assembly supplies have been depleted and valve assembly supplies had been sufficiently stocked before the supplies were depleted.



Common leak points on a valve

4.5 Waste Determination

Leak detection monitoring and no detectable emissions determinations in compliance with Subpart BB standards must take place in accordance with Method 21. Applicability determinations for equipment that may be subject to Subpart BB standards must be made in accordance with the facility waste analysis plan required by 40 CFR 264.13(b) and 265.13(b). Once collected according to the waste analysis plan, the samples must be analyzed using American Society for Testing and Materials (ASTM) Methods D 2267-88, E 169-87, E 168-88, E 260-85 or *SW-846 Methods 9060 or 8260*. Process knowledge may also be used to determine the applicability of Subpart BB standards. The basis for the process knowledge must be well documented. Examples of documentation that may be used to support a determination include production process information documenting that no organic compounds are used, information that the waste is generated by a process that is identical to a process at the same or another facility previously demonstrated by direct measurement to have a total organic concentration less than 10 percent. Process knowledge may not be used to revise a determination that an affected piece of equipment is no longer subject to the rule based on the equipment no longer containing or coming into contact with hazardous waste with an organic concentration of 10 percent by weight.

Method 21 requires the use of a photo or flame ionization detector (PID or FID) to meet certain performance criteria. Personnel using these monitoring instruments must be trained to properly calibrate and use the device and be aware of the proper techniques and applications. Monitoring results must be accurately interpreted to assure compliance with regulatory compliance. Information regarding the training program for facility personnel performing the monitoring should be addressed in the facility's permit application and in the operating log.

Vapor determinations to determine if a pump or a valve is in light liquid service may be made either by using standard reference texts to obtain the vapor pressure of each of the constituents in the waste or using ASTM Method D 2879-86.

Chapter 5 in the APTI Course 380: Introduction to Fugitive Emissions provides additional guidance on Method 21.

Performance tests to determine if a control device achieves 95 weight percent organic emission reduction must comply with Subpart AA requirements.

4.6 Recordkeeping Requirements

For each piece of equipment subject to Subpart BB regulation, the owner or operator must record the following information in the facility operating record:

EPA Region 4 requires that this information must be included in the facility's Part B permit application and the Region also attaches this information as an appendix to the facilities permit.

- the equipment identification number and hazardous waste management unit identification number;
- approximate location of the hazardous waste management unit within the facility;
- type of equipment; percent-by-weight organics; and
- hazardous waste state (i.e., gas or vapor); and methods of compliance.

The owner or operator must identify, either by list or location (area or group) of equipment that contains or contacts hazardous waste with an organic concentration of at least 10 percent by weight for a period of less than 300 hours per year.

An example of Compliance Methods for Montoring and Recordkeeping for RCRA Subparts BB and CC is outlined in the presentation by the Eastman Chemical Company

When a leak is detected the owner or operator is required to tag the piece of equipment with a weatherproof and readily visible identification tag, which is marked with the equipment identification number, the date evidence of a potential leak was found, and the date the leak was detected. This tag may be removed once the leak has been repaired for all equipment except valves. For valves, the tag may be removed after two successive months of monitoring during which no leak is detected.

When the owner or operator uses test data to demonstrate the organic removal efficiency or total organic compound concentration achieved by the control device, a performance test plan must be included in the facility operating record. Documentation of compliance with the requirements for closed-vent systems and control devices according to *40 CFR 264.1060 and 265.1060*, including the detailed design documentation or performance test results. When a leak is detected a written inspection log must also be kept in the facility operating record.

When a leak is detected a written inspection log must be maintained to include the following information: the instrument and operator identification numbers, the equipment identification number, the date of evidence of a potential leak, the date leak was detected, the dates of each attempt to repair the leak, the repair methods applied during each attempt, the date of successful repair and the reason for the delay is a leak is not repaired within 15 calendar days after discovery of the leak. When completed, the inspection log must be maintained in the operating record for three years.

If a repair is not effected within 15 days, a record must be maintained which states "repair delayed" that provides the reason for the delay and is signed by the owner or operator. The record must contain the estimated date for the completion of the repair and the date of successful repair, once accomplished.

4.7 Reporting Requirements

If a leak is detected in a valve, pump, or compressor and not repaired, or if a control device operates outside of it's design specifications, a semiannual report which identifies the facility by EPA identification number, facility name, and facility address must be submitted to the Regional Administrator. The identification number of the valve, pump, or compressor must be reported and the duration, cause and corrective action related to each control device malfunction must be recorded. The dates of any hazardous waste management unit shutdowns must also be included in the semiannual report.

4.8 Implementation Issues Associated with Subpart BB

Over the past several years, a specially trained team of inspectors from the Indiana Department of Environmental Management has conducted over 50 inspections to evaluate facility compliance withSubparts AA, BB and CC. As a result of the IDEM inspection program, a number of common misconceptions and violations have been identified. In general, IDEM found that most LQGs were not aware of or complying with Subpart BB equipment monitoring requirements. Many facilitities believed that they were exempt from Subpart BB because they held various types of general air permits or because they believed that the equipment in questions was part of a manufacturing unit and therefore exempt. In a May 26, 2000 Policy Memo, EPA provided additional guidance regarding the Agency's interpretation of the manufacturing unit exemption. EPA contends that process transfer equipment that is used for both production purposes as well as for the transfer of hazardous waste to a hazardous waste storage/ treatment tank, would be considered part of a hazardous waste tank system and therefore subject to the standards for such.

A model Subpart BB checklist may be used as a starting point in preparation for a inspection.

In recent years, there have been a number of Subpart BB enforcement cases against automobile manfacturing facilties. These facilties often generate large volumes of hazardous waste purge solvent from the cleanout of painting systems. In the past, many facilties believed that the solvent was exempt due to the recycling emeption. However, this is not the case. Once the solvent has been used to clean the spray guns and is discharged, the resulting mixture of paint and purged solvent is a hazardous waste. Any pipes, valves pumps etc are subject to both Subparts J and BB. Additional information regarding the applicability of Subpart BB to the operations of car manufacturing facilties is provided in the Subpart BB and the Automobile Industry presentation from the March 2002 RCRA Organic Air Emission Standards Permit and Compliance Training course.

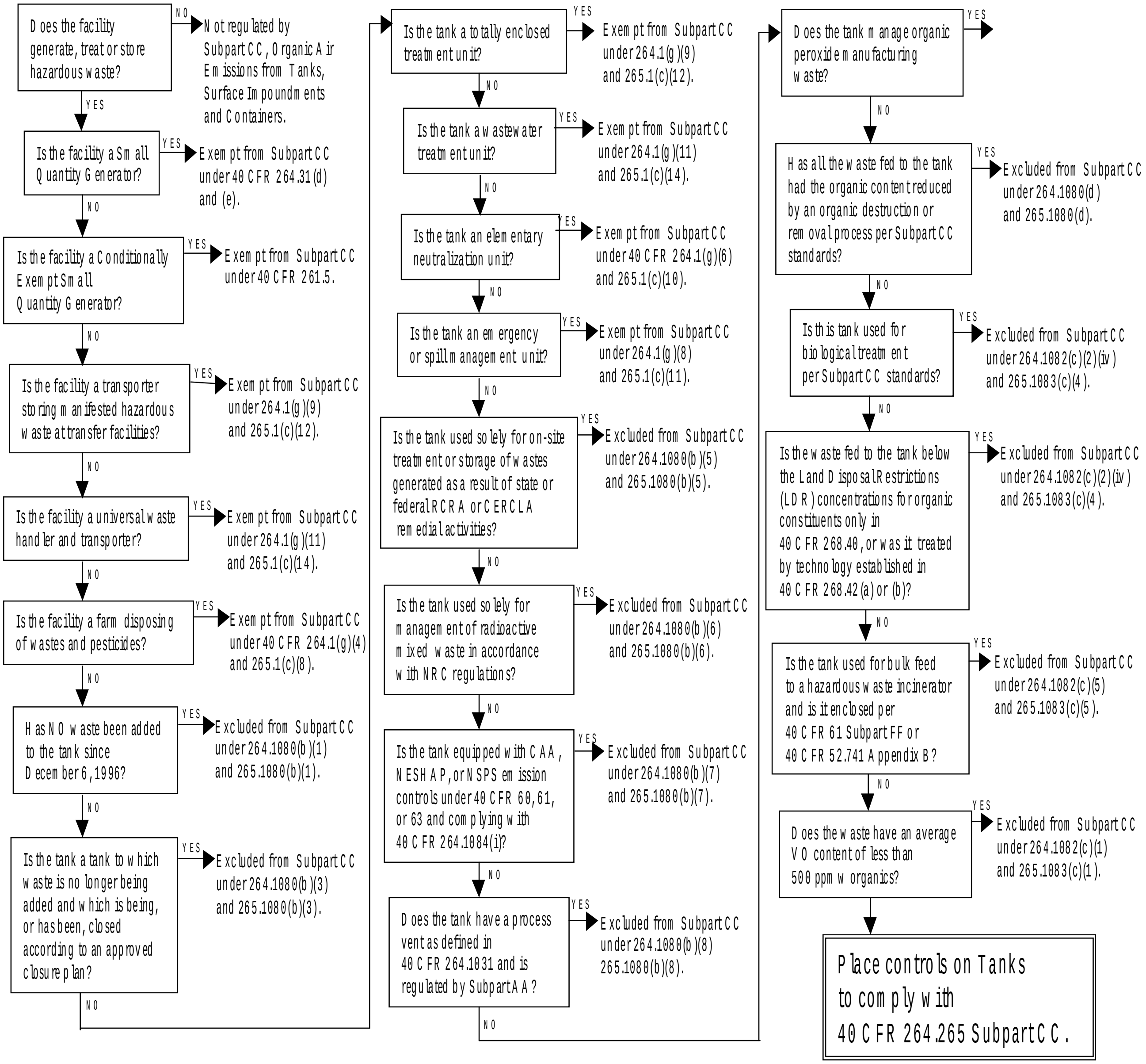
5.0 SUBPART CC STANDARDS

5.1 Applicability

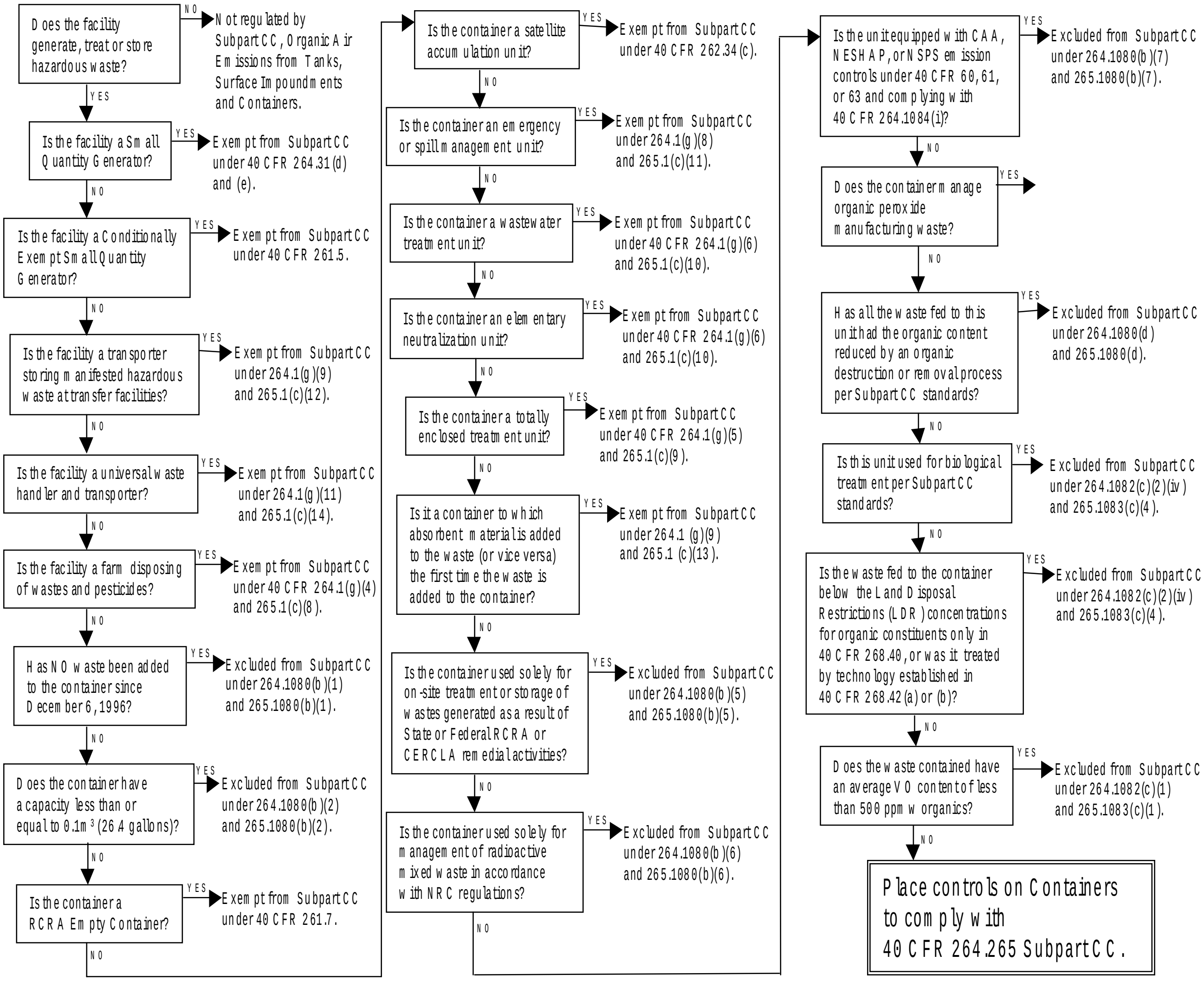
Applicability considerations for in the Subpart CC standards are provided in the following three decision trees. Decision Tree No. 1 may be used to determine if Subpart CC standards apply to tanks at a facility, Decision Tree No. 2 may be used for containers, and Decision Tree No. 3 may be used for surface impoundments. The descriptions of the exemptions and exclusions presented in the decision trees are abbreviated. Additional description of the exemptions and exclusions contained in the decision trees are provided above in Section 2.6 and in the Code of Federal Regulations. The exclusions that are identified in the decision trees do not affect the requirement to maintain appropriate records which provide information on the basis and documentation of the exclusion that is applied to the unit.

The following list indicates the different waste determination requirements for tanks, surface impoundments and containers.

Applicability Decision Tree No. 1 for Tanks



Applicability Decision Tree No. 2 for Containers



5.2 Waste Determination

A more detailed description of the waste determination requirements is described below.

Waste Determination Requirements

Waste Determination Requirements for Tanks

- An average volatile organic determination proving the average volatile organic concentration is less than 500 ppmw is required if Subpart CC controls are not applied to the tank.
- The maximum organic vapor pressure determination is required if Tank Level 1 controls are used.
- A no-detectable emissions (<500 ppmw) determination according to Method 21 is required for all closed-vent system associated with a tank.

Waste Determination Requirements for Surface Impoundments

- An average volatile organic determination proving the average volatile organic concentration is less than 500 ppmw is required if subpart CC controls are not applied to the surface impoundment.

Waste Determination Requirements for Containers

- An average volatile organic determination proving the average volatile organic concentration is less than 500 ppmw is required if subpart CC controls are not applied to the container.
- A vapor pressure determination for the organic material to determine that the waste is not in light material service is required for all containers with capacities of 0.46 m^3 or greater that use Container Level 1 controls.
- A no-detectable emissions (<500 ppmw) determination according to Method 21 is required for all closed-vent system associated with a container.

Waste determinations under Subpart CC standards are required to document compliance with the conditions of exclusions, such as VO concentration of less than 500 ppmw, determining whether a treated hazardous waste meets the requirements of the standard, determining the maximum organic vapor pressure of a hazardous waste in a tank, or determining no detectable organic emissions. Waste determinations related to hazardous waste treatment options in the Subpart CC standards are discussed in Section 5.6, below.

A determination of no detectable organic emissions shall be conducted in accordance with the procedures specified in Method 21. The results of Method 21 shall be compared to a value of 500 ppm by volume for all equipment except for rotating shaft seals which will be compared to a value of 10,000 ppm by volume.

If an owner or operator does not wish to control VO emissions from a tank, surface impoundment, or container, then the owner or operator must make a determination of the VO concentration of the hazardous waste in the unit to show that it is below 500 ppmw. An owner or operator is not required to determine the VO concentration of the waste if it is placed in a tank, surface impoundment, or container using the required air emission controls.

If a facility owner or operator wishes to take advantage of the less than 500 ppmw exemption in the standard, the VO concentration must be determined for each waste stream which is placed into the waste management unit. The waste determination must take place at the point of waste origination. For hazardous waste generated on site, the point of waste origination is the location where the waste is determined to be a hazardous waste as defined in 40 CFR 261, *Identification and Listing of Hazardous Waste*. When hazardous waste is generated off site, the location is the point where the owner or operator accepts delivery or takes possession of the hazardous waste. As discussed in 62 FR 64651, under Subpart CC the phrase "accepted at the facility" takes place once the facility owner/operator signs Item 20 of the Uniform Hazardous Waste Manifest (Appendix to 40 CFR 262). Determination of the VO concentration must be made prior to the first time the hazardous waste is placed in the affected unit. The determination must be made on an annual basis and any time conditions change affecting the VO concentration [40 CFR 264.1082(c)(1) and 265.1083(c)(1)].

Volatility is based on a compound's tendency to change from a liquid to a vapor. The VO concentration of a hazardous waste is the fraction, by weight, of the volatile organic compounds contained in a hazardous waste. For the purpose of determining the VO concentration of a hazardous waste according to the Subpart CC standards, organic compounds with a dimensionless Henry's law constant value of at least 0.1 at 25 °C must be included. This can also be expressed as $1.8 * 10^{-6}$ atmospheres/gram-mole/m^3. An alphabetical listing of compounds with Henry's law constant values less than the cutoff level is presented in Appendix VI of the December 8, 1997 clarification. A copy of this listing is included in Appendix A of this handbook. VO is expressed in terms of parts per million by weight (ppmw) and it is determined either by direct measurement or through knowledge of the waste. The direct measurement or process knowledge that is used to determine the VO concentration of a hazardous waste must comply with requirements contained in 40 CFR 265.1084(a)(2) through (4).

5.2.1 Direct Measurement

The VO concentration can be determined by testing the waste according to one of seven methods specified in the regulations or other methods validated according to Method 301. These seven methods include:

EPA Method 25D is available on the World Wide Web @ http://www.epa.gov/ttn/emc/promgate/m-25.pdf

Analytical Method	Source
Method 25D	40 CFR 60, Appendix A
Method 624	40 CFR 136, Appendix A
Method 625	40 CFR 136, Appendix A*
Method 1624	40 CFR 136, Appendix A
Method 1625	40 CFR 136, Appendix A
Method 8260	SW-846**
Method 8270	SW-846**
Any other method which has been validated by "Alternative Validation Procedure for EPA Waste and Wastewater Methods, 40 CFR 63, Appendix D or Method 301 sections 6.1, and 6.3 with correction factors between 0.7 and 1.3.	

*Perform corrections to the compounds for which the analysis is being conducted based on the accuracy as recovery using the factors in Table 7 of the method.

**A formal QC program as required by the method must be maintained to ensure minimization of loss of compounds due to evaporation, degradation, reaction, or sorption and measurement of accuracy and precision of the procedures.

It is important to note that for each of these methods, there is a published list of chemical compounds which the EPA considers the method appropriate to measure (i.e., for the SW-846 Methods the list of appropriate chemical compounds are included in SW-846). The owner or operator of the facility, may only use these methods to measure compounds that are contained on the list associated with that method. The owner or operator must evaluate the mass of all VO compounds in a waste that have a Henry's law value greater than 0.1. If Method 25D is not used, one or more of the other methods should be used that are appropriate to ensure that the waste determination accounts for all organic compounds in the waste which have Henry's law constants of at least 0.1 (0.1 Y/X or

1.8×10^{-6} atm/gram-mole/m^3 at 25 C. A list of compounds with Henry's Law constants less than 0.1 Y/X can be found in 40 CFR 265, Appendix VI and in Appendix A of this document.

5.2.2 Process Knowledge

There are many examples of process knowledge that a facility can collect to indicate that the waste has VO concentrations less than 500 ppmw. Sources such as manifests, shipping papers, waste certification notices, material balances or compound-specific test data from previous testing at this or other similar processes may be used. Documentation that the process generating the hazardous waste uses no material containing organics or test data obtained by using a method not specified or validated in accordance with Subpart CC could also be a form of process knowledge. Documentation must be maintained as is described in 40 CFR 265.1084(a)(4).

5.2.3 Average Volatile Organic Concentrations Calculations

At least four samples are required to calculate the average volatile organic concentration. These values along with the mass of the sample are needed for the average VO concentration calculation as follows:

$$C_{ave} = \frac{1}{Q_T} x \sum (Q_j x C_j)$$

(Equation 5-1)

where: C_{ave} = average VO concentration of the hazardous waste at the point of waste origination in ppmw

Q_j = mass of the discrete quantity of the hazardous waste represented by C_j in kg

Q_T = total mass of the hazardous waste for the averaging period in kg

C_j = measured VO concentration by test run for discrete quantity, "j" for the hazardous waste in ppmw

If Method 25D is used to determine the VO concentration of a hazardous waste, the carbon content and the chloride content are added together. If data from a different method is used, fractioned measured (f_m) correction values may be applied. The f_m values are located in 40 CFR Part 63, Table 34 and in Appendix B of this handbook. Once the f_m values are applied, all detects in the data are added together to give a total concentration value. This value along with the mass of the sample taken is placed into the equation defined above. The waste determination case study located in Appendix C presents a good comparison of Method 25D data and Method 8260 data. This case study presents how the four values are utilized and how the average VO concentration is calculated.

5.2.4 Sampling Procedures and Protocols

The owner or operator of the facility must collect and handle all samples in accordance with a written site sampling plan. The plan must describe the procedures for collecting representative samples such that integrity is maintained. Sampling procedures should minimize the loss of compounds due to volatilization, biodegradation, reaction or sorption during the sample collection, storage and preparation steps. The sampling plan is to be maintained on-site in the facility records.

The facility must collect and analyze at least four samples in a one year time period. More than four samples will be required for facilities with large variations in waste composition, waste quantity or fluctuations in ambient temperature.

5.2.5 Method 25D

Method 25D is the method used to test hazardous wastes to determine whether or not those wastes can be managed in units not equipped with air emission controls. The method, when applied to a waste sample produces a concentration number for comparison with the regulatory action level of 500 ppmw. The method can be used for many different waste types. Some examples of the different waste types analyzed include well-mixed wastes, multi-phase wastes and solids.

During sampling, 10 grams of waste are collected in a sample container with 30-ml of polyethylene glycol, used to suppress volatilization of the sample as it is collected. The sample container must be placed on ice or refrigerated, before and after sample collection. This procedure will minimize volatilization of the samples.

Once the samples have been collected, the waste analysis is performed using standard laboratory equipment. The method requires a controlled nitrogen purge rate of six liters per minute for a 30-minute time period. This will drive off the organics contained in the sample. The temperature of the purge gas is controlled to 75 $_{o}$C in a heated oven. The equipment is calibrated using a mixture of 10% propane and 1% vinylidene chloride in nitrogen. Two detectors are required in Method

25D. A flame ionization detector (FID) is used to measure the carbon content of vapors driven off the sample by the nitrogen purge. An electrolytic conductivity detector (ELCD) measure the chlorine content of the vapors driven off by the purge stream. This split analysis involves adding the carbon and chlorine results. The sum is reported as a concentration number, ppmw in the waste sample.

5.3 Tanks

5.3.1 Control Technologies Overview

The RCRA organic air emissions standards have two levels of control for emissions from tanks managing hazardous waste with organic concentration equal to or greater than 500 ppmw. These control levels are referred to as Tank Level 1 controls and Tank Level 2 controls. If a tank is required to used controls, the control level applicable to the tank is determined by the tank design capacity and the maximum organic vapor pressure of the material in the tank. The following capacity and vapor pressure limits are set forth in the Subpart CC rule at 40 CFR 265.1085(b)(1).

Criteria for Tank Level 1 Controls

Tank Capacity		Maximum Vapor Pressure		
cubic meters	**gallons, approximate**	**kiloPascals**	**mm Hg**	**psi**
≥ 151	≥ 40,000	5.2	39	0.75
≥ 75 and ≤ 151	≥ 20,000 and < 40,000	27.6	207	4.0
< 75	<20,000	76.6	574	11.1

Reference: 40 CFR 264.1084(b)(1)(i)

Tanks which meet these capacity and vapor pressure criteria can use Tank Level 1 or Tank Level 2 controls [40 CFR 265.1085(b)(1)] provided that the waste in the tank is not heated such that the waste in the tank exceeds the maximum vapor pressure limits set forth above and provided that the waste in the tank is not treated by a waste stabilization process as defined in 40 CFR 265.1081.

If the waste in the tank does not meet these criteria the tank can only use Tank Level 2 controls. Method 25E, found in 40 CFR Part 60, Appendix A, is one method used to determine the vapor pressure of waste managed in tanks. ASTM Method 2879-92, methods described in API Publication 2517, and methods obtained from standard reference texts are other ways to determine the vapor pressure in the tank.

5.3.2 Tank Level 1 Controls

A tank is allowed to use the Level 1 controls if it does not exceed the maximum organic vapor pressure for that tank design capacity as shown in the Table presented above. The hazardous waste in the tank can not be heated by the owner or operator to a temperature that is greater than the temperature at which the maximum organic vapor pressure of the hazardous waste was determined. The hazardous waste in the tank also can not be treated by the owner or operator using a waste stabilization process or other exothermic process. The tank level 1 control requirements consist of a fixed roof meeting appropriate design, operation, inspection and recordkeeping requirements.

The fixed roof and its closure devices must be designed to form a continuous barrier over the entire surface area of the hazardous waste in the tank. The fixed roof may be a separate cover installed on the roof or may be an integral part of the tank structural design. The fixed roof must be designed and installed so there are no visible cracks, holes, gaps or other open spaces between roof section joints or between the interface of the roof edge and tank wall. Each opening in the fixed roof must be either equipped with a closure device or connected by a closed-vent system that is vented to a control device. If the opening is equipped with a closure device, it must be designed to operate such that when the closure device is secured in the closed position there are no visible cracks, holes, gaps or other open spaces in the closure device or between the perimeter of the opening and the closure device. If the opening is connected to a closed-vent system vented to a control device, the control device must remove or destroy organics in the vent stream, in accordance with the requirements for control devices in 264.1033 and 265.1033 and it must be in operation any time the hazardous waste is managed in the tank.

Inspector's Tip:

Results of an IDEM inpsection program reveal a high rate of leakage from tank control devices and vents regulated under Subpart CC.

The fixed roof and all closure devices must be constructed of suitable materials that will minimize exposure of the hazardous waste to the atmosphere and will maintain the integrity of the fixed roof and closure devices throughout their intended service life. Factors to be considered when selecting the materials for and designing the fixed roof and closure devices shall include: organic vapor permeability, the effects of any contact with the hazardous waste or its vapors managed in the tank; the effects of outdoor exposure to wind, moisture, and sunlight; and the operating practices used for the tank on which the fixed roof is installed.

Photo of an unsecured sampling port hatch on a level 2 tank.

Additional guidance on conservation vents can be found in Guidance Document for RCRA Hazardous Waste Air Emission Standards Under 40 CFR Parts 264 and 265: Implementation of Subpart CC Standards for Pressure Relief Device Requirements for Tanks Using Level 1 Controls.

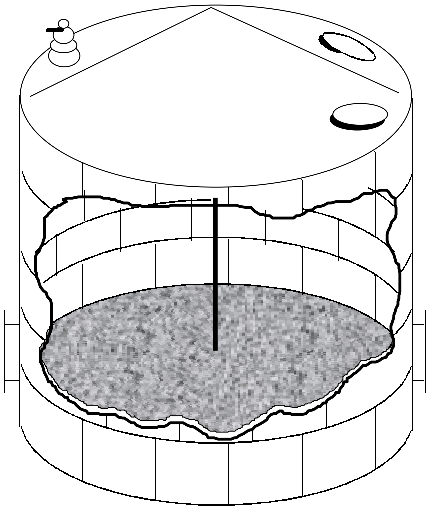
The closure devices must be secured in the closed positions at all times hazardous waste is in the tank. Opening of closure devices or removal of the fixed roof is allowed to provide access to the tank for performing routine inspection, maintenance, other activities needed for normal operations or to remove accumulated sludge or other residues from the bottom of the tank. The owner or operator must promptly secure the closure device in the closed position or reinstall the cover to the tank, once the activity was completed.

Tank Level 1 controls allow the opening of a spring-loaded pressure-vacuum relief valve, conservation vent or similar type of pressure relief device which vents to the atmosphere in order to maintain the tank internal pressure in accordance with the tank design specifications. The pressure relief device must be designed to operate with no detectable organic emissions when the device is secured in the closed position. The settings at which the device opens must be established for the device to remain in the closed position when the tanks internal pressure is within the internal pressure operating range. The internal pressure operating range must be determined by the owner or operator based on the tank manufacturers recommendations, applicable regulations, fire protection and prevention codes, standard engineering codes and practices, or other requirements for the safe handling of flammable, ignitable, explosive, reactive or hazardous materials. An example of normal operating conditions that may require a device to open is during loading operations when the tank internal pressure will exceed the internal pressure operating range established for the tank. Another example of when pressure relief devices may be required to function is as a result of diurnal temperature fluctuations with hot daytime temperatures and cooler nighttime temperatures. Opening of a safety device is allowed at any time conditions require doing so in order to avoid an unsafe condition.

The owner or operator must inspect the air emission control equipment to ensure it is installed and operating correctly. The fixed roof and its closure devices must be visually inspected by the owner or operator to check for defects that could result in air pollutant emissions. Defects include, but are not limited to, visible cracks, holes, or gaps in the roof sections or between the roof and the tank wall; broken, cracked, or otherwise damaged seals or gaskets on closure devices; and broken or missing hatches, access covers, caps or other closure devices. The owner or operator must perform an initial inspection of the fixed roof and its closure devices prior to using a tank subject to

Subpart CC and on an annual basis. In the event that a defect is detected, the owner or operator must repair the defect within 45 calendar days of detection. A first attempt at repair must be made no later than five calendar days from detection. Repair delays are allowed if the owner or operator determines that the repair of the defect requires emptying or temporary removal from service of the tank and no alternative tank capacity is available at the site to accept the hazardous waste managed if the tank stops operation. The defects must be repaired before the process or unit resumes operation.

For more information on Tank requirements under Subparts BB and CCrefer to the Takin in Tanks presentation from the March 2002 EPA Region 4 RCRA Organic Air Emissiion Standards Permit and Compliance Training.



Following the initial inspection and monitoring of the cover as required by the Subpart CC regulations, subsequent inspection and monitoring must be performed annually. Inspection and monitoring may be performed at intervals longer than 1 year when inspecting or monitoring the cover would expose a worker to unsafe conditions. If unsafe conditions exist then the owner or operator may designate a cover as an unsafe to inspect and monitor cover. The owner or operator must prepare a written explanation stating the reasons why the cover is unsafe to visually inspect or monitor. A written plan and schedule for inspection and monitoring of the cover must be also be prepared.

When a tank is buried partially or entirely underground, an owner or operator is required to inspect and monitor only these portions of the tank cover and those connections to the tank that are located on or above the ground surface. General tank requirements contained in Subpart J of 40 CFR 264 and 265 contain additional tank requirements not related to Subpart CC standards, such as secondary containment or leaks and spills and other operational requirements.

5.3.3 Tank Level 2 Controls

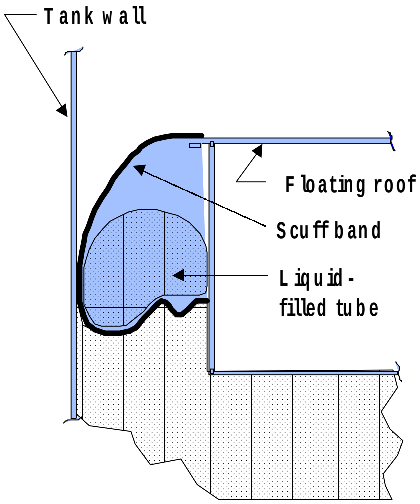
For those tanks containing waste which exceed the maximum organic vapor pressure for tank design capacity or if stabilization or other exothermic treatment process is occurring in the tank, Tank Level 2 controls must be used. An owner or operator may choose Tank Level 2 controls even if the maximum organic vapor pressure for the tank is not exceeded or if stabilization is not occurring in that specific tank.

This can be done to avoid waste determination requirements for situations where waste composition is widely varied. There are five different control options within the Tank Level 2 category.

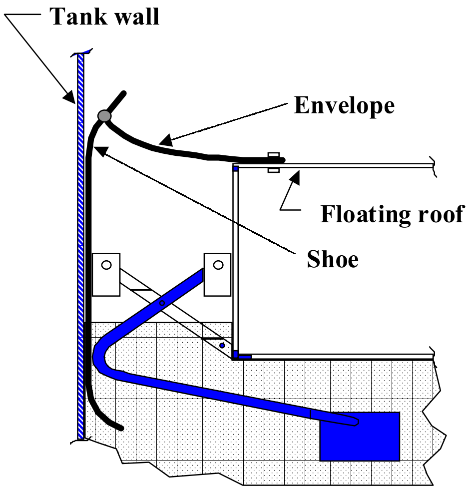
The five different options are as follows:

- Cover vented to a control device
- Pressure Tank
- Fixed Roof Tank with Internal Floating Roof Tank
- Tank Equipped with an External Floating Roof
- Tank inside an Enclosure which is vented to an Enclosed Combustion Device

5.3.3.1 Fixed Roof Tank with Internal Floating Roof



IFR Liquid-mounted seal



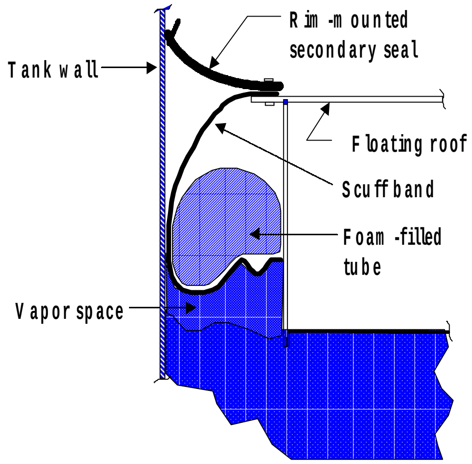
IFR Mechanical Shoe Seal

The internal floating roof in a fixed roof tank with IFR design must float on the liquid surface except when the floating roof must be supported by the leg supports. The internal floating roof must be equipped with a continuous seal between the wall of the tank and the floating roof edge. The continuous seal must be either a single continuous seal that is either liquid-mounted or a metallic shoe seal or two continuous seals mounted one above the other.

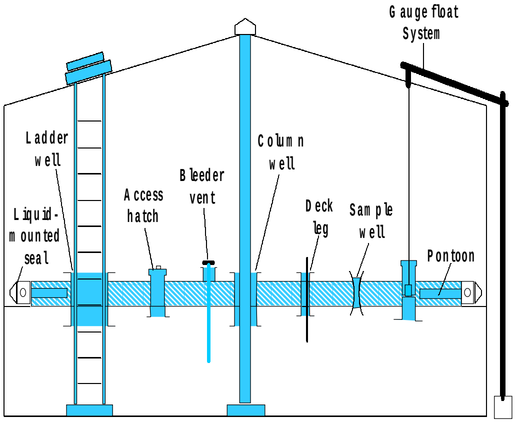
A liquid-mounted seal is a foam or liquid filled primary seal mounted in contact with hazardous waste between the tanks wall and the floating roof continuously around the circumference of the tank. A metallic shoe seal is a continuous seal constructed of metal sheets which are held vertically against the wall of the tank by spring weighted levels or other mechanisms and is connected to the floating roof by braces or other means. If a metallic shoe seal is used for the primary seal, the metallic shoe seal must be designed so that one end extends into the liquid in the tank and the other end extends a vertical distance of at least 61 centimeters above the liquid surface. If two continuous seals are used the lower seal may be a vapor-mounted seal. Each opening, with the exception of automatic bleeder vents, in a noncontact internal floating roof must provide projection below the liquid surface.

Each opening in the internal floating roof must be equipped with a gasketed cover or a gasketed lid except for leg sleeves, automatic bleeder vents, rim space vents, column wells, ladder wells, sample wells and stub drains. Each penetration of the internal floating roof for the purpose of sampling must have a slit fabric cover that covers at least 90 percent of the opening. Each automatic bleeder vent and rim space vent must be gasketed. Each penetration of the internal floating roof that allows for passage of a column supporting the fixed roof must have a flexible fabric sleeve seal or a gasketed sliding cover.

The filling, emptying or refilling process must be continuous and completed as soon as possible. Automatic bleeder vents must



IFR Vapor-Mounted Seal with Secondary Seal



Internal Floating Roof

be closed at all times when the roof is floating, except when the roof is being floated off or resting on the leg supports. Prior to filling the tank, each cover, access hatch, gauge float well or lid on any opening in the internal floating roof must be bolted or fastened closed. Rim space vents must be set to open only when the internal floating roof is not floating or when the pressure beneath the rim exceeds the manufacturer's recommended setting.

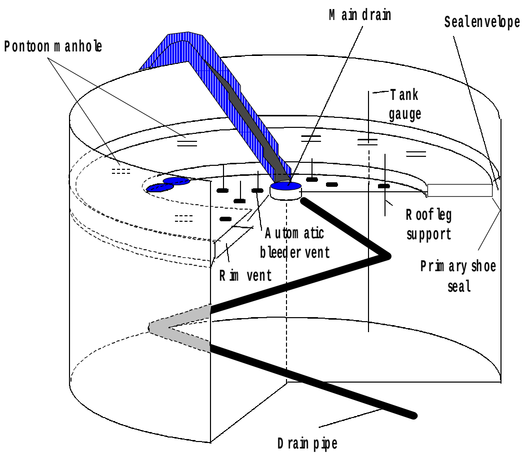
The floating roof and its closure devices must be visually inspected by the owner or operator to check for defects that could result in air pollutant emissions. A partial listing of defects include: the internal floating roof is not floating on surface of the liquid inside the tank; liquid has accumulated on top of the internal floating roof; any portion of the roof seals have detached from the roof rim; holes, tears or other openings are visible in the seal fabric; the gaskets no longer close off the hazardous waste surface from the atmosphere; or the slotted membrane has more than 10 percent open area.

The owner or operator must visually inspect the internal floating roof components prior to its initial filling and through openings on the fixed-roof at least once every 12 months thereafter. A visual inspection of the internal floating roof, primary seal, secondary seal, gaskets, slotted membranes, and sleeve seals must be completed each time the tank is emptied and degassed. The tank must be emptied, degassed for inspection at least once every 10 years. If the internal floating roof is equipped with two continuous seals mounted one above the other, the owner or operator may visually inspect the internal floating roof, primary and secondary seals, gaskets, slotted membranes and sleeve seals each time the tank is emptied and degassed. The tank must be emptied, degassed for inspection at least once every 10 years.

The owner or operator must notify the Regional Administrator of the date and location of the inspection 30 calendar days before refilling the tank. When a visual inspection is unplanned, the owner or operator must notify the Regional Administrator as soon as possible, but no later than seven calendar days before refilling of the tank. This notification may be made by telephone and immediately followed by a written explanation for why the inspection is unplanned. Alternatively, written notification, including the explanation for the unplanned inspection, may be sent so that it is received by the Regional Administrator at least seven calendar days before refilling the tank.

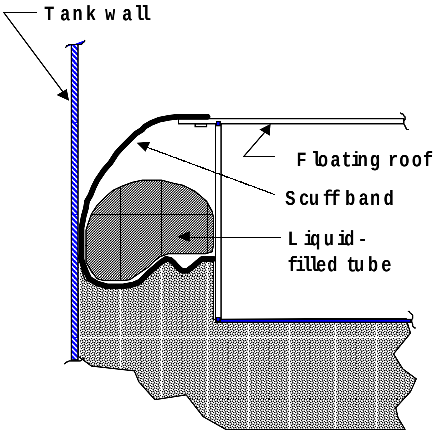
5.3.3.2 External Floating Roof

An external floating roof must be designed to float on the liquid surface except when the floating roof must be supported by the leg supports. The external floating roof must be equipped with two continuous seals, one above the other, between the tank wall of the tank and the roof edge. The lower seal is referred to as the primary seal, and the upper seal is referred to as the secondary seal.



External Floating Roof Tank

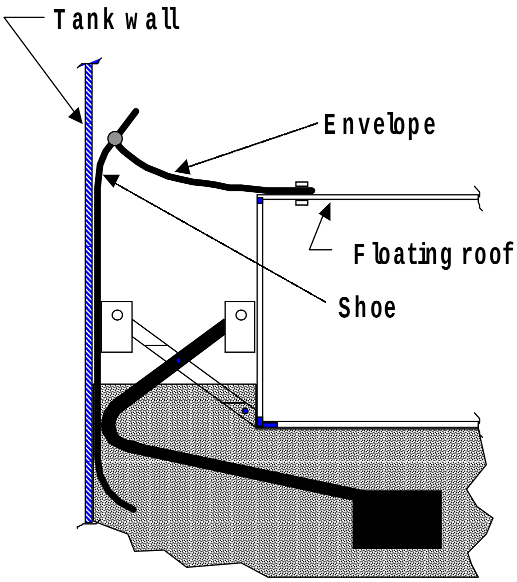
The primary must be either a liquid-mounted or metallic shoe seal. A liquid-mounted seal is a foam or liquid filled primary seal mounted in contact with hazardous waste between the tanks wall and the floating roof continuously around the circumference of the tank. A metallic shoe seal is a continuous seal constructed of metal sheets which are held vertically against the wall of the tank by spring weighted levels or other mechanisms and is connected to the floating roof by braces or other means. The total area of the gaps between the tank wall and the primary seal must not exceed 212 square centimeters (cm$_2$) per meter of tank diameter, and the width of any portion of these gaps must not exceed 3.8 centimeters (cm). If a metallic shoe seal is used, it must be designed so that one end extends into the liquid in the tank and the other end extends a vertical distance of at least 61 cm above the liquid surface.



EFR Liquid-Mounted Seal

The secondary seal must be mounted above the primary seal and cover the annular space between the floating roof and the wall of the tank. The total area of the gaps between the tank wall and the secondary seal must not exceed 21.2 cm$_2$ per meter of tank diameter, and the width of any portion of these gaps must not exceed 1.3 cm.

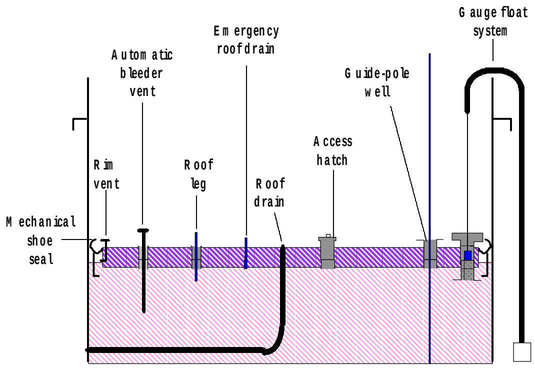
In order to minimize emissions of volatile organics from the tank the following operating conditions must be met: All openings in the noncontact external floating roof, with the exception of automatic bleeder vents and rim space vents, must project below the liquid surface. Except for automatic bleeder vents, rim space vents, roof drains, and leg sleeves, each opening in the roof must be equipped with a gasketed cover, seal or lid. Each access hatch and each gauge float well must be equipped with a cover designed to be bolted or fastened when the cover is secured in the closed position. Each automatic bleeder vent and each rim space vent must be equipped with a gasket. Each roof drain that empties into the liquid managed in the tank must be equipped with a slotted membrane fabric cover that covers at least 90 percent of the area of the opening. Each unslotted and slotted guide pole must be equipped with a gasketed sliding cover or a flexible fabric sleeve seal. Each unslotted guide pole must be equipped with a gasketed cap on the end of the pole. Each slotted guide pole must be equipped with a gasketed cover.



EFR Mechanical Shoe Seal

The process of filling, emptying, or refilling must be continuous and completed as soon as possible. With the exception of automatic bleeder vents, rim space vents, roof drains and leg sleeves, each opening in the roof must be secured and maintained in a closed position at all times except when the closure device must be open for access. Covers on each access hatch and each gauge float well must be bolted or fastened when secured in the closed position. Automatic bleeder vents must be set closed at all times when the roof is floating, except when the roof is being floated off or is being landed on the leg supports. Rim space vents must be set to open only at those times that the roof is being floated off the roof leg supports or when the pressure beneath the rim seal exceeds the manufacturer's recommended setting.

The cap on the end of each unslotted guide pole must be secured in the closed position at all times except when the measuring the level or collecting samples of the liquid in the tank. The cover on each gauge hatch sample well must be secured in the closed position at all times except when the hatch or well must be opened for access. Both the primary seal and the secondary seal must completely cover the annular space between the external floating roof and the wall of the tank in a continuous fashion except during inspections.



External Floating Roof Tank

The owner or operator must perform measurements of gaps between the tank wall and the primary seal within 60 calendar days after initial operation (the time the tank first accepts waste) of the tank following installation of the floating roof and, thereafter, at least once every five days. The owner or operator must perform measurements of gaps between the tank wall and the secondary seal within 60 calendar days after initial operation of the tank following installation of the floating roof and, thereafter, at least once every year. If a tank ceases to hold hazardous waste for a period of one year or more, subsequent introduction of hazardous waste into the tank must be considered an initial operation.

The owner or operator must determine the total surface area of gaps in the primary seal and in the secondary seal individually. The seal gap measurements must be performed at one or more floating roof levels when the roof is floating on the roof supports. Seal gaps, if any, must be measured around the entire perimeter of the floating roof in each place where a 0.32 cm diameter uniform probe passes freely (without forcing or binding against the seal) between the seal and the wall of the tank and measure the circumferential distance of each such location. For a seal gap measured, the gap surface area will be determined using probes of various widths to measure accurately the actual distance from the tank wall to the seal and multiplying each such width by its respective circumferential distance.

The total gap area must be calculated by adding the gap surface areas determined for each identified gap location for the primary seal and the secondary seal individually, and then dividing the sum for each seal type by the nominal perimeter of the tank. These total gap areas for the primary seal and secondary seal are then compared to the respective standards for the seal type. If the seal gap exceed 212 cm_2 per meter of tank diameter for the primary seal or 21.2 cm_2 per meter of tank diameter for the secondary seal, the owner or operator must repair the defect within 45 calendar days of its detection. A first attempt at repair must occur within five days of its detection.

The owner or operator must visually inspect the floating roof and its closure devices for defects that could result in air pollutant emissions. A partial listing of defects include: holes, tears, or other openings in the rim seal detached from the floating roof; all or a portion of the floating roof deck being submerged below the surface of the liquid in the tank; broken, cracked or otherwise damaged seals or gaskets on closure devices; and broken or missing hatches, access covers, caps or other closure devices. These visual inspections must be performed on an annual basis.

Any defects noted during a visual inspection must be repaired as soon as possible but no later than 45 calendar days from the day of their detection. A first attempt at repair must occur within five calendar days from the day of its detection.

The owner or operator must notify the Regional Administrator of the date and location of the inspection 30 calendar days before refilling the tank. When a visual inspection is unplanned, the owner or operator must notify the Regional Administrator as soon as possible, but no later than seven calendar days before refilling the tank. This notification may be made by telephone and immediately followed by a written explanation for why the inspection is unplanned. Alternatively, written notification, including the explanation for the unplanned inspection, may be sent so that it is received by the Regional Administrator at least seven calendar days before refilling the tank.

5.3.3.3 Cover Vented to a Control Device

The fundamental concept of this control option is to collect the organic vapors from a tank under the fixed roof, transport those vapors through the closed-vent system, and then destroy the organics in the approved control device. Examples of control devices capable of meeting the requirements of these standards include thermal vapor incinerators, catalytic vapor incinerators, flares, boilers, process heaters, condensers, and carbon absorption systems. Closed-vent systems and control devices used to comply with the Subpart CC standards must also comply with many of the requirements contained in the Subpart AA standards. The specific requirements for closed-vent systems and control devices are contained in 40 CFR 264.1087 and 265.1088.

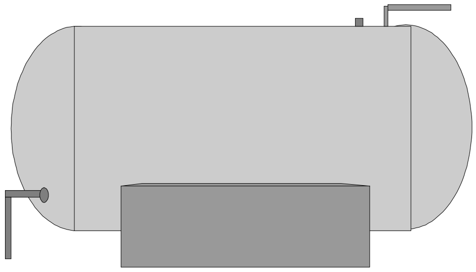
The fixed roof tank and its closure devices must be designed to form a continuous barrier over the entire surface area of the liquid in the tank. Each opening in the fixed roof not vented to the control device must be equipped with a closure device. If the pressure in the vapor headspace underneath the fixed roof is less than atmospheric pressure when the control device is operating, the closure devices must be designed to operate so that when the closure device is secured in the closed position there are no visible cracks, holes, gaps or other open spaces in the closure device or between the perimeter of the cover opening and the closure device. If the pressure in the vapor headspace underneath the fixed roof is equal to or greater than atmospheric pressure when the control device is operating, the closure device must be designed to operate with no detectable organic emissions, which means it operates with emissions less than 500 ppm above background.

The fixed roof and its closure devices must be constructed of materials that will minimize exposure of the hazardous waste to the atmosphere, to the extent practical, and will maintain the integrity of the fixed roof and closure devices throughout their intended service life. It is important to consider the following factors when selecting materials: organic vapor permeability, the effects of any contact with the liquid and its vapor managed in the tank, the effects of outdoor exposure to wind, moisture, and sunlight, and the operating practices used for the tank on which the fixed roof is installed.

Whenever a hazardous waste is in the tank, the fixed roof must be installed with each closure device secured in the closed position and the vapor headspace underneath the fixed roof must be vented to the control device. Closure devices may be opened to provide access to the tank to perform routine activities needed for normal operations such as inspection, maintenance, or to remove accumulated sludge or other residues from the bottom of the tank. Following the completion of the activity, the owner or operator must promptly secure the closure device in the closed position or reinstall the cover to the tank.

The fixed roof and its closure devices must be visually inspected by the owner or operator to check for defects that could result in air pollutant emissions. Defects include, but are not limited to, visible cracks, holes or gaps in the roof sections or between the roof and the tank wall, broken or damaged seals or gaskets on closure devices and broken or missing hatches, access covers, caps or other closure devices. The closed-vent system and control device must be inspected and monitored by the owner or operator with the requirements in 40 CFR 264.1033. The owner or operator must perform an initial inspection of the air emission control equipment on or before the date the tank becomes subject to Subpart CC.

5.3.3.4 Pressure Tank



The tank must be designed not to vent to the atmosphere as a result of compression of the vapor headspace in the tank during the filling of the tank to its design capacity. All tank openings must be equipped with closure devices designed to operate with no detectable emissions. Whenever a hazardous waste is in the tank, the tank must be operated as a closed system that does not vent to the atmosphere except in the event that a safety device is required to open to avoid an unsafe condition.

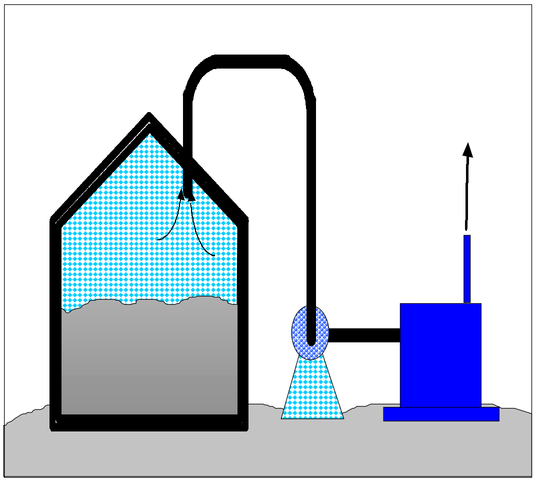
The pressure tank and its closure devices must be visually inspected annually to check for defects. In addition, the closure devices must be tested to ensure operation at no detectable emissions, operating at less than 500 ppmw above background. No detectable emissions are tested annually according to 40 CFR 60 Method 21.

5.3.3.5 Enclosure Vented through a Closed-Vent System to an Enclosed Combustion Control Device

Additional Guidance on Enclosurescan be found in the following documents:

Guidelines for Determining Capture Efficiency

Enclosure Criteria Handout



For a tank applying this control option, the tank must be located inside an enclosure, which is designed and operated in accordance with the criteria for a permanent total enclosure as specified in "Procedure T - Criteria for and Verification of a Permanent or Temporary Total Enclosure" under 40 CFR 52.741, Appendix B. It is the responsibility of the owner or operator to perform the verification procedure for the enclosure as specified in Section 5.0 to "Procedure T - Criteria for and Verification of a Permanent or Temporary Total Enclosure" initially when the enclosure is first installed and annually thereafter. The criteria for permanent total enclosure as described in "Procedure T" are included in this hand book in Appendix D.

The enclosure may have permanent or temporary openings to allow worker access; passage of material into or out of the enclosure by conveyor, vehicles, or other mechanical means; entry of permanent mechanical or electrical equipment; or direct airflow into the enclosure. Safety devices may be installed and operated as necessary on any enclosure, closed-vent system or control device.

The enclosure must be vented through a closed-vent system to an enclosed combustion control device that is designed and operated in accordance with the standards for either a vapor incinerator, boiler, or process heater that are found in 40 CFR 264.1087 and 265.1088. See Section 5.5 in this manual for details of control device requirements.

The owner or operator must inspect and monitor the closed-vent system and control devices. The control device must be inspected and monitored in accordance with the procedures specified in 40 CFR 265.1033(f)(2) and 265.1033(k). The readings from each monitoring device required by 40 CFR 265.1033(f)(2) must be inspected at least once per operating day to check control device operation. The closed-vent system must be monitored using an instrument annually, to ensure that it is operated with no detectable emissions.

5.3.4 Waste Transfer Requirements

Any transfer of hazardous waste from a tank to another tank or from a tank to a surface impoundment must be conducted using continuous hard piping or another closed system if the tanks are subject to Subpart CC requirements. The waste transfer system must not allow exposure of the hazardous waste to the atmosphere. An individual drain system is considered to be a closed system when it meets the requirements of 40 CFR part

63, Subpart RR (National Emission Standards for Individual Drain Systems).

5.3.5 Repair Requirements

The owner or operator must repair each defect detected during an inspection within 45 calendar days of detection. A first attempt at repair must be made no later than five calendar days after detection of the defect. Repair of a defect may be delayed beyond 45 calendar days if the owner or operator determines that repair of the defect requires emptying or the temporary removal from service of the tank and no alternative tank capacity is available at the site to accept the hazardous waste that is normally managed in the tank. The owner or operator must repair the defect the next time the process or unit that is generating the hazardous waste managed in the tanks stops operation. Repair of the defect must be completed before the process or unit resumes operation.

5.3.6 Recordkeeping Requirements

Additional information regarding the recordkeeping requirements for Subparts nd CC can be found in General Recordkeeping and Reporting Guidance for Waste Management Units Requiring Air Emission Controls Under RCRA Air Standard Subpart CC.

The owner or operator must prepare and maintain records for each tank using air emission controls in accordance with Subpart CC regulations (265.1085). The records must include a tank identification number. Records of each inspection must be kept by the owner or operator for at least three years. Inspection records must include the date of the inspection and information for each defect that was detected during the inspection including the location of the defect, a description of the defect, the date of detection, and the corrective action taken to repair the defect. For defects not repaired within 45 calendar days, the owner or operator must record the reason for the delay and the date of that completion of the repair is expected.

If the Tank Level 1 Control option (fixed-roof tank) is used the owner or operator must keep on record the vapor pressure determination of the waste for each tank. The records must include the date and time the samples were collected, the analysis method used and the analysis results. This determination must be performed before the waste is placed into the tank and at any time the conditions change that would increase the vapor pressure of the waste.

When an internal floating roof is used to comply with Tank Level 2 control, the owner or operator must prepare and maintain documentation describing the floating roof design. Owners or Operators using an external floating roof to comply with Tank Level 2 control must prepare and maintain documentation describing the floating roof design and the dimensions of the tank. Records of each seal gap inspection describing the results of the seal gap measurements must also be maintained for at least three years. The records must include the date that the measurements were performed, the raw data obtained for the measurement, and the calculation of the total gap surface area. When the seal gap measurements exceeded the specifications outlined in 40 CFR 265.1085(f)(1) the records must include a description of the repairs that were made, the date the repairs were made, and the date the tank was emptied, if necessary.

A Practical Guide to a State BB/CC Inspection Program presentation from the EPA Region 4 RCRA Organic Air Emission Standards Permit and Compliance Training Course provides additional information on Subpart CC tank inspections.

If an enclosure is used to comply with the Tank Level 2 control requirements the owner or operator must prepare and maintain records of the most recent set of calculations and measurements performed to verify that the enclosure meets the criteria outlined in "Procedure T." Certification that is signed and dated by the owner or operator stating that the control device is designed to operate at the performance level (reduction of organics by at least 95 percent) must be maintained by the owner or operator. If a design analysis is used, then design documentation as specified in 40 CFR 265.1035(b)(4) and must be included. The documentation must include information prepared by the owner or operator or provided by the control device manufacturer or vendor that describes the control device design in accordance with 40 CFR 265.1035(b)(4)(iii) and certification by the owner or operator that the control equipment meets the applicable specifications. If performance tests are used, the performance test plan and all test results must be maintained in the facility records.

The owner or operator must record on a semiannual basis, information on planned routine maintenance operations that would require the control device not to meet the requirements of 265.1088(c)(1). Also, records must be maintained which provide a description of the planned routine maintenance which is anticipated for the control device during the next six month period. This information must include the type of maintenance necessary, planned frequency of maintenance, and lengths of maintenance periods. A description of the planned routine maintenance that was performed for the control device during the previous six month period must be maintained. This description must include the type of maintenance performed and the total number of hours during those six months that the control device did not meet the requirements of 265.1088(c)(1).

The owner or operator is required to record information regarding unexpected control device system malfunctions that would require the control device not to meet the requirements of 265.1088(c)(1). This information must include the occurrence and duration of each malfunction of the control device system. The duration of each period during the malfunction when gases, vapors, or fumes are vented from the waste management unit through the closed-vent system to the control device while the control device was not properly functioning. Actions taken during the periods of malfunction to restore a malfunctioning control device to its normal or usual manner of operation must be recorded. Records of management of carbon removed from a carbon adsorption system must be maintained.

5.4 Containers

Containers with organic waste with concentrations equal to or greater than 500 ppmw must apply controls to the containers to limit the exposure of organics to the atmosphere. There are three levels of controls for containers. The use of a specific level of control is determined by the size of the container, the type of waste within the container (i.e., light-material, etc.) and if any stabilization, as defined in 40 CFR 265.1081, is occurring within the container.

Criteria for Container Control Requirements

Container Size		Service of Container	Container Control
cubic meters	gallons, approx.		
<0.1	< 2.4	Exempt for Subpart CC	Not Subject
> 0.1 and ≤ 0.46	> 2.4 and ≤ 122	Light or heavy material service	Container Level 1
> 0.46	>122	Heavy material service	Container Level 1
> 0.46	>122	Light material service	Container Level 2
> 0.1	> 2.4	Waste stabilization	Container Level 3

5.4.1 Container Level 1 Controls

In order to use Container Level 1 controls, the container must be less than or equal 0.46 m$_3$. Containers greater than 0.46 m$_3$ may be used if it does not contain light materials. Light material is defined as a waste stream will contain one or more compound which have a vapor pressure greater than 0.3 kiloPascals (KPa) at 20°C. The organic constituents with vapor pressures exceeding 0.3 KPa must make up at least 20 percent by weight of the waste steam. Heavy material service is anything that is not light liquid or gas vapor service. No waste stabilization may occur in the container. Level 1 controls may not be used for waste undergoing stabilization.

For additional guidance on containers in light material service consult: In-Light Material Service Determination for Containers.

Once the owner or operator has determined that a Level 1 container may be used, one of three options of controls may be selected. The three Container Level 1 controls that may be used are:

- Use a container that meets the U.S. Department of Transportation (DOT) regulations on packaging hazardous materials for transportation;

- Use a container equipped with a cover and closure devices which provide a continuous barrier over the container openings so when the cover and closure devices are in the closed position there are no visible gaps, holes or openings. The cover may be a separate cover installed on the container or it may be an integral part of the container structural design. The covers and closure devices must be constructed of suitable materials to minimize exposure and to maintain the equipment integrity for as long as it is in service;

- And use an open-top container with an organic-vapor suppressing barrier placed on or over the hazardous waste in the container so that the no hazardous waste is exposed to the atmosphere.

The covers and closure devices must be secured in closed positions any time hazardous waste is stored in the container. The opening of a closure device or cover is permitted to add hazardous waste to the container. The addition of waste to a container should be done in a continuous manner and, once finished, the owner or operator must promptly secure the closure devices in the closed position and install the covers. When the waste is added in an intermittent manner, the owner or operator must promptly secure the closure device in the closed position and install the covers as soon as the container is filled or, if it is not filled, the container must be closed if no additional waste has been added to the container within 15 minutes. Also, the container must be closed if the person performing the loading operation leaves the immediate vicinity of the container or if there is a shutdown of the process generating the material being added to the container.

Opening a closure device or a cover is permitted to remove hazardous waste from the container. When discrete quantities of material are removed from the container the owner or operator must promptly secure the closure devices in the closed position and install covers after no additional material will be removed from the container within 15 minutes or the person performing the unloading operation leaves the immediate vicinity of the container.

The opening of a closure device or a cover is also allowed when access inside the container is needed to perform routine activities other than the transfer of a hazardous waste. Some examples of routine activities are collection of samples, a measurement of the depth of the liquid in the container, or the monitoring of equipment inside the container.

A spring-loaded pressure-vacuum relief valve, conservation vent or similar type of pressure relief device which vents to the atmosphere is allowed to open during normal operations in order to maintain the internal pressure of the container in accordance with the container design specifications. The relief device must be designed to operate with no-detectable emissions when in the secured closed position. The setting at which the device opens must be established so that the device remains in the closed position whenever the internal pressure of the container is within the internal pressure operating range. The internal pressure operating range must be determined by the owner or operator based on the container manufacturer recommendations, applicable regulations, fire protection and prevention codes and practices and other requirements for the safe handling of flammable, ignitable, explosive, reactive or hazardous materials. The opening of a safety device is permitted at any time conditions require doing so to avoid an unsafe condition.

The owner or operator using Container Level 1 controls must inspect the containers and their covers and closure devices upon completion of filling. If a hazardous waste is already in the container at the time the owner or operator first accepts the possession of the container (i.e., once the owner or operator signs the Uniform Hazardous Waste manifest) the owner or operator must visually inspect the container within 24 hours of acceptance. The container must be inspected for visible cracks, holes, gaps or other open spaces into the interior of the container when the cover and closure devices are secured in the closed position. If a defect is noted, the owner or operator must repair the defect within five calendar days. A first attempt at repair must be made within 24 hours of detection.

The owner or operator must maintain a copy of the determination that containers with capacity greater than 0.46 m^3 are not managing hazardous waste in light material service.

5.4.2 Container Level 2 Controls

Container Level 2 controls may be used for waste stored in containers greater than 0.46 m^3 which manage material in light liquid service. Level 2 controls can not be used for waste undergoing stabilization. Container Level 2 controls include three different options from which the owner or operator may choose:

- Use a container that meets the applicable regulations of U.S. Department of Transportation (DOT) on packaging hazardous materials for transportation.

- Use a container which is operating with no detectable emissions. No detectable emissions must be certified in accordance with Method 21 to operate at less than 500 ppm by volume. In the case when a hazardous waste is already in the container at the time the waste is accepted at the facility, a visual inspection must be made initially upon receipt of the container and annually thereafter. When the no detectable emissions test is performed, the container must be filled with organic hazardous waste representative of the range of volatile organic concentrations for the hazardous wastes expected to be managed in the container. Each potential leak interface on the container, cover and associated closure devices must be checked. During the test the cover and closure devices must be in the closed position.

- Use a vapor-tight container. A vapor-tight container must be certified using Method 27, initially and annually thereafter. A pressure of 4,500 Pascals is applied to the container and then removed, and the pressure change is monitored over time. If the pressure change is less than 750 Pascals within five minutes, the container is designated as a vapor-tight container.

Photograph of a rolloff which contains volatile organic waste. Note that there is no cover on this unit.

Any transfer of hazardous waste in or out of a container requiring Container Level 2 controls must be conducted in a manner to minimize exposure of the hazardous waste to the atmosphere, to the extent practical, considering the physical properties of the hazardous waste and good engineering and safety practices. Some methods recommended by EPA include: submerged-fill pipe or other submerged-fill method to load liquids into the container; a vapor-balancing system or a vapor-recovery system to collect and control the vapors displaces from the container during filling operations; or a fitted opening in the top of a container through which the hazardous waste is filled and subsequently purging the transfer line before removing it from the container opening. Splash-loading methods are prohibited for containers meeting Container Level 2 criteria.

A quickconnect still in the hatch however no loading is being conducted therefore the container is open. Containers need to be closed at all times except during actual waste transfer operations. This is a commonly observed violation.

The cover and closure devices must be secured and in the closed position whenever hazardous waste is stored in the container. The opening of a closure device or cover is permitted to add waste to the container. When the addition of waste is performed in a continuous manner, the owner or operator must promptly secure the closure devices in the closed position and install the covers, once the filling operation is complete. During batch operations, the owner or operator must promptly secure the closure device in the closed position and install the covers, when the container is filled to the intended level; the completion of the batch loading with no additional material added to the container within 15 minutes; the person performing the loading operation leaves the immediate vicinity of the container or shutdown of the process generating the material being added to the container.

The closure device or cover may be opened to remove waste. When discrete quantities of material are removed from the container the owner or operator must promptly secure the closure devices in the closed position and install covers upon the completion of a batch removal after which no additional material will be removed from the container within 15 minutes or the person performing the unloading operation leaves the immediate vicinity of the container.

The opening of a closure device or a cover is also allowed when access inside the container is needed to perform routine activities other than the transfer of a hazardous waste. Some examples of routine activities are collection of samples, measurement of the level of liquid in the container, and recording readings of equipment inside the container. A spring-loaded pressure-vacuum relief valve, conservation vent or similar type of pressure relief device which vents to the atmosphere is allowed to open during normal operations in order to maintain the internal pressure of the container in accordance with the container design specifications. The relief device must be designed to operate with no-detectable emissions, less than 500 ppm above background, when in the secured closed position. The setting at which the device opens must be established so that the device remains in the closed position whenever the internal pressure of the container is within the internal pressure operating range determined by the owner or operator based on the container manufacturer recommendations, applicable regulations, fire protection and prevention codes and practices and other requirements for the safe handling of flammable, ignitable, explosive, reactive or hazardous materials. Opening of a safety device is permitted at any time conditions require doing so to avoid an unsafe condition.

The owner or operator must inspect all containers using Container Level 2 controls upon filling. When the hazardous waste is already in the container at the time the owner or operator accepts possession of the container, the owner or operator has 24 hours to perform a visual inspection. The visual inspection will be conducted to check for visible cracks, holes, gaps, or other open spaces into the interior of the container when the closure devices and cover are secured in the closed position. The owner or operator must repair any defects that were detected within five days of detection. A first attempt at repair must begin within 24 hours of detection.

When a container , used to manage hazardous, remains at the facility for a period of a year or more, the owner or operator must visually inspect the container and its cover and closure devices initially upon receipt of the container and thereafter at least once every 12 months. The owner or operator must check for any visible cracks, holes, gaps or other open spaces into the interior of the container when the closure device and cover are in the secured closed position. Again, when a defect is detected, a first attempt at repair must begin within 24 hours of detection, and must be completed within five days of detection.

5.4.3 Container Level 3 Controls

If waste stabilization is occurring within the container, the owner or operator must use Container Level 3 controls. There are two options for Level 3 controls.

- Use a container that is vented through a closed-vent system to a control device; and

- Use a container that is vented inside an enclosure which is exhausted through a closed-vent system to a control device.

If the container is vented through a closed-vent system to a control device, the closed-vent system must be designed for no detectable emission (less than 500 ppm) in accordance with Method 21. This determination must be conducted initially and then annually thereafter. The control devices must meet the requirements of 40 CFR 264.1087 and 265.1088 which contain requirement that are specific to each control device.

When a container is vented inside an enclosure which is exhausted through a closed-vent system to a control device, the enclosure must be designed and operated in accordance with the criteria for a permanent total enclosure as specified in "Procedure T- Criteria for and Verification of a Permanent or Temporary Total Enclosure" under 40 CFR 52.741, Appendix B. The enclosure is permitted to have permanent or temporary openings to allow worker access; passage of containers through the enclosure by conveyor or other mechanical means; entry of permanent mechanical or electrical equipment; or direct airflow into the enclosure. The owner or operator must certify the enclosure in accordance with Procedure T, initially and annually thereafter.

The closed-vent system associated with the enclosure must be designed to operate with no detectable emissions as described above for closed-vent systems. This must be certified initially and annually thereafter. The control device must be designed and operated in accordance with the requirements of 40 CFR 264.1087.

Safety devices are permitted on any container, enclosure or closed-vent system. Such devices must remain in the closed position except during emergency, unplanned events.

The owner or operator must maintain records that the enclosure meets Procedure T. Records that the closed-vent system is operating at no detectable emissions must also be maintained. Each control device has specific monitoring requirements that are continuously recorded and maintained.

5.5 Closed-Vent Systems and Control Devices

5.5.1 Overview

A control device by definition, as presented in 40 CFR 264.1031, is an enclosed combustion device, vapor recovery system or flare. In RCRA air standards, devices which recover or capture solvents or other organics for use, reuse or sale are not control devices.

Control devices can be installed to reduce the organic air emissions from units such as tanks, surface impoundment and containers. In order to comply with the Subpart CC standards, the control device must reduce organic air emissions by 95 percent or greater. It is important for the owner or operator of the facility to choose the proper control device and install and operate the device properly in order to receive optimum reduction of organic emissions. Each control device must be installed and operated in accordance with the manufacturer's specifications and the requirements contained in 40 CFR 264.1087 and 265.1088. The control device and closed-vent system requirements of subpart CC are the same requirements outlined in subparts AA and BB. A more detailed description of these requirements can be found in sections 3.1 and 3.2 of this document.

5.5.2 Vapor Recovery Control Devices

Additional information regarding control devices can be found in Control Devices and Closed Vent Systems presentation from the March 2002 EPA Region 4 RCRA Organic Air Emission Standards Permit and Compliance Training.

A control device involving vapor recovery must be designed and operated to recover the organic vapors vented to it with an efficiency of 95 weight percent or greater. If the total organic emission limits for all affected process vents at a facility are maintained at an efficiency of greater than 95 weight percent, the vapor recovery device may be operated at an efficiency of less than 95 weight percent. Examples of vapor recovery units include condensers and carbon adsorbers. These units are discussed in more detail in the following table and Section 5.5.6.

Examples of Vapor Recovery Units

Condenser

A condenser is a heat-transfer device that converts a gas or vapor to a liquid by reducing the temperature. Condensers are simple, relatively inexpensive devices that usually use water to cool and condense a vapor stream. However, these devices are usually not capable of reaching low temperatures (below 21°C), therefore high removal efficiencies are not obtained unless the vapors will condense at high temperatures (usually above 38°C). The two types of condenser technologies are contact condensers and surface condensers. In a contact condenser, the coolant and vapor stream are physically mixed. The condensed vapor and coolant leave the condenser as a single exhaust stream. In a surface condenser, the coolant is separated from the vapors by tubular heat-transfer surfaces. The coolant and condensed vapors leave the device by separate exits.

Carbon Adsorption

Adsorption is a mass transfer process in which molecules are removed from a fluid stream because they adhere to the surface of a solid such as carbon. In a carbon adsorption system, the waste air stream is passed through a layer (bed) of solid carbon particles. As the air stream passes through the bed of carbon particles, the pollutant molecules adsorb to the surface of the solid adsorbent. The bed of adsorbent carbon will eventually become saturated with the pollutant. The adsorbent bed must then be disposed of and replaced or the pollutant vapors must be desorbed before the adsorbent bed can be reused.

5.5.3 Flares

Flare systems are primarily used to handle large amounts of waste gas or vapors. Gas containing organics is continually fed to and discharged from a stack, with the combustion occurring near the top of the stack and characterized by a flame at the end of the stack. Although flares can be used to destroy organics in accordance with Subpart CC standards, such system can present safety problems including explosion and thermal-radiation hazards from the flame.

The heat content of the waste stream to be disposed is an important consideration in the design and operation of a flare. The gases can either support their own combustion or not. In general, a heating value greater than 7443 kJ/m_3 can be flared successfully. If the heating value is below 7443 kJ/m_3 it may be necessary to enrich the waste gas by injecting another gas with a higher heating value. Gases with a heating value as low as 2233 kJ/m_3 have been flared but at a significant fuel demand. It is usually not feasible to flare a gas with a heating value below 3721 kJ/m_3.

5.5.4 Enclosed Combustion Devices

An enclosed combustion device may be used to reduce organic air emissions of Subpart CC units by 95 percent or greater. Some examples of enclosed combustion devices are thermal vapor incinerators, boilers and process heaters.

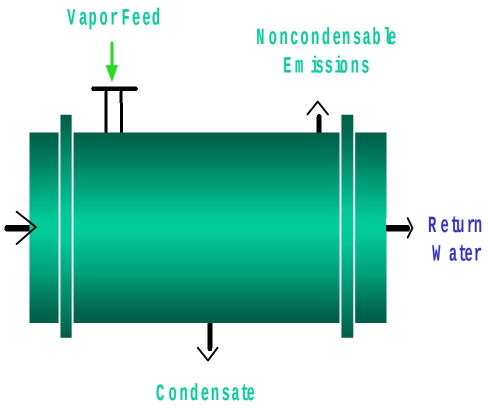
Examples of Enclosed Combustion Devices

Thermal vapor incinerator
Thermal vapor incinerators can be used over a fairly wide but low range of organic vapor concentrations. The concentration of the organics in the air stream that is to be treated must be substantially below the lower flammable level (lower explosive limit). Reactions are conducted at elevated temperatures to ensure high chemical-reaction rates for the organics. Thermal vapor incinerators are equipped with a burner at one end that fires a fuel. There is also a fume inlet near the burner where the gas stream to be oxidized enters the incinerator. The burner may utilize the air in the waste stream as the combustion air for the fuel or it may use a separate source of outside air for this purpose. Thermal vapor incinerators generally operate at a temperature between 1300 to 1600 °F.
Catalytic vapor incinerators
A catalytic incinerator provides contact of a waste stream with a catalyst bed. This allows oxidation reaction to occur rapidly in the temperature range of 700 to 900°F, in contrast to the 1300 to 1600°F required for thermal vapor incinerators. The heat required to bring the waste stream up to the required oxidation temperature is usually supplied by a fuel burner. The catalyst bed is located at a distance downstream of the mixture of combustion products and waste gas stream.

Examples of Enclosed Combustion Devices

Boilers
Boilers have been designed to burn a wide range of fuels. Boilers are steam generators that provide power, steam, or both to an industrial plant. Boilers are employed over a wide range of applications from large power-generating units to small low-pressure units used for space or process heating.
Process heaters
Process heaters transfer heat liberated by burning fuel to fluids contained in tubes.

5.5.5 Inspection and Monitoring Requirements



Additional information regarding carbon absorbtion systems can be found in Carbon Bed Fires and the Use of Carbon Canisters for Air Emission Controls on Fixed Roof Tanks.

Condenser

If a condenser is used, the owner or operator has two choices for monitoring the unit. The first option is a monitoring device equipped with a continuous recorder to measure the concentration level of the organic compounds in the exhaust vent stream from the condenser. This value will be used to show that there is 95 percent reduction of organics in the waste stream. The other option is to install a temperature monitoring device equipped with a continuous recorder. This device must be installed at a location in the exhaust vent stream from the condenser. This location was selected because the monitoring of the gas exhaust provides a direct characterization of the performance of the condenser. The temperature monitoring device must operate with an accuracy of + 1 percent of the temperature being monitored in $_{o}$C or + 0.5 $_{o}$C . This measurement will indicate if the condenser is operating at optimum capacity in order to reduce organics by 95 percent or greater.

Carbon Absorber

When a carbon adsorber is used the owner or operator must monitor the unit to determine when breakthrough has occurred. If the unit is a fixed-bed carbon adsorber that regenerates the carbon bed directly in the control device, the owner or operator has two options for monitoring. The first is to install a continuous recorder to monitor the organic concentration in the exhaust vent stream from the carbon bed. A large increase in organic concentration would indicate that breakthrough has occurred and that the carbon needs to be regenerated. If there are no large increases of organic concentrations, the adsorber is being regenerated before breakthrough has occurred and will continue to operate at optimum capacity. The other option, is to install a monitoring device equipped with a continuous recorder to measure a parameter that indicates the carbon bed is regenerated on a regular predetermined time cycle. The owner or operator must inspect the readings from each monitoring device at least once each operating day to insure the control device is operating at optimum capacity.

A fixed-bed carbon adsorber that regenerates the carbon bed directly onsite in the control device, must replace the existing carbon in the control device with fresh carbon at a regular, predetermined time interval that is no longer than the carbon service life. The owner or operator must determine the time breakthrough will occur in the carbon adsorber using performance tests or engineering calculations. The predetermined time interval will then be less than the time of breakthrough.

A carbon adsorption system such as a carbon canister that does not regenerate the carbon bed directly onsite in the control device must replace the existing carbon in the control device with fresh carbon on a regular basis using one of two options. The first option is to monitor the concentration level of the organic compounds in the exhaust vent stream from the carbon adsorption system on a regular schedule and replace the existing carbon with fresh carbon immediately when carbon breakthrough is indicated. The monitoring frequency must be daily or at an interval no greater than 20 percent of the time required to consume the total carbon working capacity, whichever is greater. The second option is to replace the existing carbon with fresh carbon at a regular, predetermined time interval that is less than the design carbon replacement interval.

Flare

A flare used to comply with the Subpart CC regulations must be steam-assisted, air-assisted or nonassisted. A flare must be designed for and operated with no visible emissions as determined by Method 22 which is found in 40 CFR part 60. This method requires there to be no visible emissions except for periods not to exceed a total of five minutes during any two consecutive hours. The flare must be operated with a flame present at all times. A heat sensing monitoring device with a continuous recorder is used to indicate the continuous ignition of the pilot flame.

The flare may only be used if the net heating value of the gas being combusted is 11.2 MJ/scmn (300 Btu/scf) or greater, if the flare is steam-assisted or air-assisted. The flare can operate if the net heating value of the gas being combusted is 7.45 MJ/scm (200 Btu/scf) or greater if the flare is nonassisted. The net heating value of the gas being combusted must be determined using the following equation:

$$H_T = K \left[\sum C_i H_i \right]$$

(Equation 5-1)

where: H_T = Net heating value of the sample, MJ/S.M.; where the net enthalpy per mole of off gas is based on combustion at 25 °C and 760 mm Hg, but the standard temperature for determining the volume corresponding to 1 mol is 20 °C;

K = Constant, 1.74×10^{-7} (1/ppm) (g mol/S.M.) (MJ/kcal) where standard temperature for (g mol/S.M.) is 20 °C;

C_i = Concentration of sample component i in ppm on a wet basis, as measured for organics by Reference Method 18 in 40 CFR part 60 and measured for hydrogen and carbon monoxide by ASTM D 1946-82; and

H_i = Net heat of combustion of sample component i, kcal/g mol at 25 °C and 760 mmHg. The heats of combustion may be determined using ASTM D 2383 if published values are not available or cannot be calculated.

A steam-assisted or nonassisted flare must be designed for and operated with an exit velocity of less than 18.3 m/s (60 ft/s). If the net heating value of the gas being combusted is greater than 37.3 MJ/SCM., a steam-assisted or nonassisted flare may be designed for and operated with an exit velocity equal to or greater than 18.3 m/s but must be less than 122 m/s. The exit velocity must be determined by dividing the volumetric flow rate (in units of standard temperature and pressure), as determined by Reference Methods 2, 2A, 2C, or 2D in 40 CFR part 60 as appropriate, by the unobstructed cross-sectional area of the flare tip.

A steam-assisted or nonassisted flare which is designed for and operated with an exit velocity, less than the velocity V_{max}, and less than 122 m/s is allowed. The maximum allowed velocity, V_{max}, is determined by the following equation:

$$\mathrm{Log}_{10}(V_{max}) = (H_T + 28.8)/31.7$$

(Equation 5-2)

where: H_T = The net heating value
28.8 = constant
31.7 = constant

An air-assisted flare must be designed and operated with an exit velocity less than the velocity, V_{max}. The maximum allowed velocity, V_{max}, for an air-assisted flare must be determined by the following equation:

$$V_{max} = 8.706 + 0.7084\,(H_T)$$

(Equation 5-3)

where: 8.706 = constant
0.7084 = constant
H_T = The net heating value

Enclosed Combustion Devices

Enclosed combustion devices must be operated to achieve one of the following three conditions: i) reduce the organic emissions vented to it by 95 weight percent or greater; ii) achieve a total organic compound concentration of 20 ppmv, expressed as the sum of actual compounds, not carbon equivalents, on a dry basis corrected to three percent oxygen; or, iii) provide a minimum residence time of 0.5 seconds at a minimum temperature of 760 °C.

If a thermal vapor incinerator is used as a control device, the incinerator must have a temperature monitoring device equipped with a continuous recorder installed at a location downstream of the combustion zone. Catalytic vapor incinerators are required to have a temperature monitoring device installed at two locations. One location must be in the vent stream feeding the unit at the nearest feasible point to the catalyst bed inlet. The other location must be in the vent stream at the nearest feasible point to the catalyst bed outlet.

If the enclosed combustion device is a boiler or process heater, then the vent stream must be introduced into the flame combustion zone of the boiler or process heater. There are specific monitoring requirements required for boilers and process heaters to insure a reduction of organics by 95 percent or greater. A temperature monitoring device with a continuous recorder is required for a boiler or process heater with a design capacity less than 44 MW. This temperature monitoring device must have an accuracy of + 1 percent of the temperature being monitored in °C or +0.5 °C, whichever is greater. The temperature sensor must be installed at a location in the furnace downstream of the combustion zone. If the boiler or process heater has a design capacity greater than or equal to 44 MW, a monitoring device equipped with a continuous recorder to measure a parameter(s) that indicates good combustion operating practices are being used must be installed. A device that measures the organic concentration of the effluent of the boiler or process heater is one example of such a parameter.

5.5.6 Recordkeeping Requirements

The owner or operator must include a detailed engineering description of the control devices used. This must include the manufacturer's name and model number of control device, the type of control device, the dimensions of the control device, the capacity, and the construction materials.

The facility records must include a statement signed and dated by the owner or operator certifying that the operating parameters used in the design analysis reasonably represent the conditions that exist when the hazardous waste management unit is or would be operating at the highest load or capacity level reasonably expected to occur. A statement signed and dated by the owner or operator certifying that the control device is designed to operate at an efficiency of 95 percent or greater must be included. The facility records must also include a statement provided by the control device manufacturer or vendor certifying that the control equipment meets the design specifications and may be used to comply with this. If performance tests are used to demonstrate compliance, all test results must be provided.

Design documentation and monitoring, operating, and inspection information for each closed-vent system and control device required to comply with the provisions of this part must be recorded and kept up-to-date in the facility operating record. This information must include a description and date of each modification that is made to the closed-vent system or control device design. An identification of operating parameter, description of monitoring device, and diagram of monitoring sensor location or locations are also required. The records must also include all monitoring, operating and inspection information. When exceedance of the monitoring parameter occur, the date, time and duration or each period that occurs while the control device is operating when any monitored parameter exceeds the value established in the control device design analysis must be recorded.

5.6 Treatment Alternatives

Treatment alternatives allow owners or operators of tanks, surface impoundments, and containers to select alternative provisions for determining when a treated hazardous waste is no longer required to be managed in accordance with Subpart CC control requirements. Air emissions controls are no longer required for waste management in downstream units receiving hazardous waste which has been treated to meet the criteria found in 40 CFR 265.1083(c)(2). The waste determination processes for each of the treatment alternatives considered in the Subpart CC standards are specified in 40 CFR 265.1084(a) and (b). A treatment alternative case study is included in this handbook in Appendix C.

5.6.1 Treatment Alternative 1

A process that removes or destroys the organics to an established exit concentration limit (C_T) established for the process. In order to meet the waste treatment criteria specified for this alternative, the volatile organic concentration at the point of waste treatment must be less than a value. The exit concentration limit calculated is mass weighted to account for waste volume as well as concentration. The diagram included below illustrates treatment alternative 1. To calculate the exit concentration limit, the volatile organic concentrations at point A and point B are required.

$$C_t = \frac{\sum_{x=1}^{m} (Q_x \text{ x } C_{ave_x}) + \sum_{y=1}^{n} (Q_y \text{ x } 500 \text{ ppmw})}{\sum_{x=1}^{m} Q_x + \sum_{y=1}^{n} Q_y}$$

(Equation 5-4)

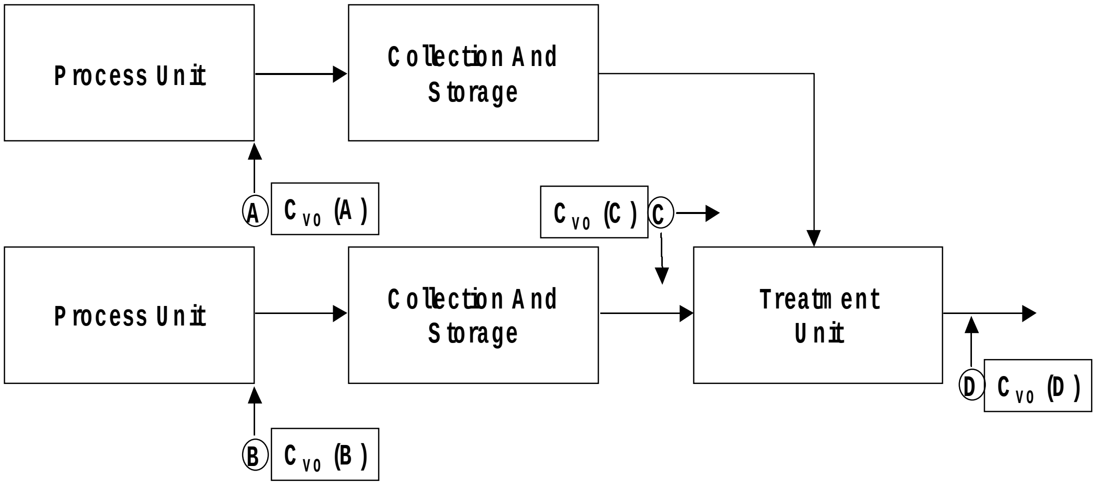
Where: C_t = Exit concentration limit, ppmw.

x = Individual waste stream “x” that has an average VO concentration less than 500 ppmw.

y = Individual waste stream “y” that has an average VO concentration equal to or greater than 500 ppmw.

m = Total number of “x” waste streams treated by process.

n = Total number of "y" waste streams treated by process.
Q_x = Annual mass quantity of hazardous waste stream "x," kg/yr.
Q_y = Annual mass quantity of hazardous waste stream "y," kg/yr.
C_{ave_x} = Average VO concentration of hazardous waste stream "x" at the point of waste origination.



A = Point of waste origination, C_{VO} (A) > 500 ppm
B = Point of waste origination, C_{VO} (B) < 500 ppm
D = Exit concentration, C_{VO}

$\boxed{C_{VO} < C_t}$

C_T is calculated using VO concentration at points A and B
C_{VO} is determined at point D, point of waste treatment

Treatment Process Alternative 1

The VO concentration at the point of treatment would be determined at point D, the point of waste treatment. If the volatile organic concentration at point D is less than the exit concentration limit determined by the equation presented above, the criteria of this treatment alternative is met.

One of the advantages of using the exit concentration limit treatment alternative to achieve compliance with the Subpart CC standards is that it accounts for mixing of waste streams with volatile organic concentrations above and below 500 ppmw. This allows it to account for dilution due to the potential inclusion of waste streams which contain low concentrations of volatile organic compounds. Other advantages of this treatment alternative are that it does not require a 95 percent reduction of organics for every influent stream and it limits the number of waste determinations that are required.

5.6.2 Treatment Alternative 2

A process that removes the organic reduction efficiency such that the removal is greater than 95%. In order to meet the criteria of this alternative, two values must be determined. The first is the organic reduction efficiency (R) which is calculated using the waste volatile organic mass flow entering and exiting the treatment process. The value R is calculated using the following equations:

$$E_a = \frac{1}{10^6} \sum (Q_{aj} \text{ x } C_{vo,\,aj})$$

Waste VO mass entering treatment (Equation 5-5)

$$E_b = \frac{1}{10^6} \sum (Q_{bj} \text{ x } C_{vo,\,bj})$$

Waste VO mass exiting treatment (Equation 5-6)

where: E_a = Waste volatile organic mass flow exiting the process, kg/hr
E_b = Waste volatile organic mass flow entering the process, kg/hr
m = Total number of runs
j = Individual run "j"
Q_b = Mass of hazardous waste entering during run "j", kg/hr
Q_a = Mass of hazardous waste exiting during run "j", kg/hr

The values for E_a and E_b are then used to calculate R as follows:

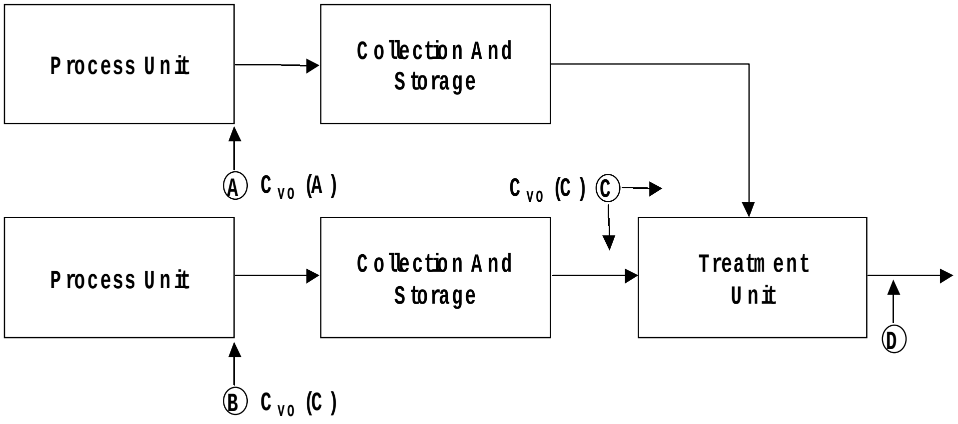
$$R = \left(\frac{E_b - E_a}{E_b}\right) \text{x } 100\%$$

(Equation 5-7)

The waste VO mass flow entering the treatment unit (E_b) is determined at point C in the figure below, while the waste VO mass flow exiting the treatment unit (E_a) is determined at point D.

The second term that is required to determine if the organic reduction efficiency treatment alternative meets necessary criteria is an exit concentration. The exit concentration is determined at the point where the waste stream exits the treatment unit, point D in the figure above.

If the organic reduction efficiency for the treatment process is greater than or equal to 95 percent and the average VO concentration of the treated waste stream, determined as the exit concentration, is less than 100 ppmw, then air emission controls are not required on the tanks, surface impoundments, and containers that manage the exit waste streams.



A = Point of waste origination
B = Point of waste origination
C = Point where waste enters process, mass entering calculated at this point
D = Exit point, mass exiting calculated at this point

$$R = \frac{\text{Mass (in)} - \text{Mass (out)}}{\text{Mass (in)}} \quad [R \geq 95\% \text{ and } C_{VO} < 100 \text{ ppmw}]$$

C_{VO} is determined at point D, point of waste treatment

Treatment Alternative 2

Advantages of using the organic reduction efficiency treatment alternative include that it limits the number and location of waste determinations required and it does not require any waste determinations at the point of waste origination. The determinations are required only at the points entering and exiting the treatment unit. This alternative may be appropriate for cases where a large number of waste streams are combined for central treatment.

5.6.3 Treatment Alternative 3

The third treatment alternative is referred to as the organic mass removal rate alternative. Two values must be calculated to determine if the criteria of this treatment alternative have been met.

The first term, the required organic mass removal rate (RMR) is based on each of the hazardous waste streams which, when measured at the point of waste origination, have an average VO concentration equal to or greater than 500 ppmw. The determination of RMR requires using the average volumetric flow rate and the density of these less than 500 ppmw wastes as determined at their point of waste origination, points A and B in Figure 3 below. The volatile organic concentration, the volumetric flow rate and the waste density are used to calculate the RMR using the following equation:

$$RMR = \sum_{x=1}^{n} [V_y \text{ x } k_y \text{ x } \frac{C_{ave_y} - 500 \text{ ppmw}}{10^6}]$$

(Equation 5-8)

where: RMR = Required organic mass removal rate, kg/hr
y = Individual waste stream "y" with a C_{ave} equal to or greater than 500 ppmw
n = Total number of "y" waste streams
V_y = Average volumetric flow rate of waste stream "y", m^3/hr
k_y = Density of hazardous waste stream "y", kg/m^3
C_{ave_y} = Average volatile organic concentration for hazardous waste stream "y" at the point of waste origination, ppmw

The second term required for this treatment alternative is the organic mass removal rate (MR). MR is the calculated difference between the organic mass flow entering and exiting the treatment unit, points C and D in Figure 3 below. The organic mass removal rate is also represented by the following equation:

$$MR = E_b - E_a$$

(Equation 5-9)

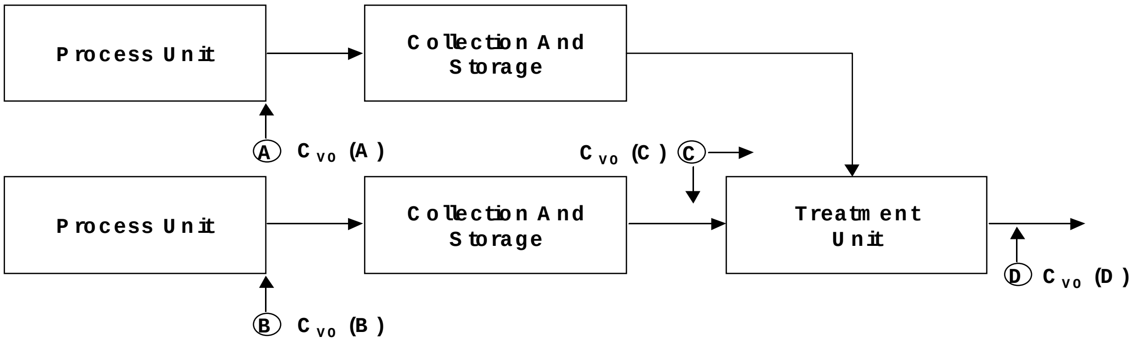
where:

$$E_a = \frac{1}{10^6} \sum (Q_{aj} \text{ x } C_{vo, aj})$$

(Equation 5-5)

$$E_b = \frac{1}{10^6} \sum (Q_{bj} \text{ x } C_{vo, bj})$$

(Equation 5-6)



A = Point of waste origination
B = Point of waste origination
C = Point where waste enters process, mass entering calculated at this point
D = Exit point, mass exiting calculated at this point

$$MR = Mass\ (in) - Mass\ (out)$$

$$[MR > RMR]$$

Treatment Alternative 3

Advantages of the organic mass removal rate treatment alternative include that it does not require a 95 percent VO reduction for every influent waste stream, the required organic mass removal rate is not waste stream specific but is based on the aggregated volatile organic mass of the untreated waste entering the treatment process, and it limits the number of waste determinations because it is based on mass rather than concentration.

5.6.4 Treatment Alternative 4

There are two biological degradation alternatives. One method to demonstrate the organic reduction efficiency (R) and the organic biodegradation efficiency (R_{bio}) are both equal to or greater than 95 percent.

Organic reduction efficiency (R) calculations are described above in Section 6.5.2. R_{bio} is calculated using the following equation:

$$\mathbf{R_{bio} = F_{bio} \times 100\%}$$

(Equation 5-10)

In order to meet the second format, the actual mass of volatile organics reduced through biological process (MR_{bio}) must be greater than or equal to the calculated required mass removal rate for the wastes entering the biological unit. If either of these formats are met, no further control is required for the treated wastes.

Additional information regarding biological treatment is available in the following documents: Biological Treatment Units Case Study and Solutions to Biological Treatment Case Study.

The required organic mass removal rate (RMR) calculations are described above in Section 5.6.2. The actual organic mass biodegradation rate (MR_{bio}) is calculated using the following equation:

$$MR_{bio} = E_b \times F_{bio}$$

(Equation 5-11)

Where: MR_{bio} =Actual organic mass biodegradation rate, kg/hr
Eb =Waste organic mass flow entering the process, kg/hr
F_{bio} =Fraction of organic biodegraded as determined using the procedure specified in 40 CFR 63, Appendix C

There are several advantages associated with treatment alternative 4. One advantage is that the use of aerobic biodegradation in uncovered units is permitted for units that meet specified treatment criteria. The R_{bio} option may be appropriate for cases where a large number of waste streams are combined for central waste treatment. The MR_{bio} option is not waste stream specific and does not require a 95 percent reduction for every waste stream, only aggregated volatile organic mass of the untreated waste.

5.6.5 Treatment Alternative 5

The treatment process must meet three conditions in order to comply with this alternative. Any subsequent storage and treatment does not require CC controls. The three conditions are as follows:

- Appropriate Subpart CC air emission controls must be used prior to treatment from the point of waste origination through the point of waste treatment;

- Any transfer of the waste must have been done using a closed system such as continuous hard-piping that does not allow exposure of waste to the atmosphere; and

- The volatile organic concentration at the point of waste treatment must be less than the lowest individual waste stream volatile organic concentration entering the treatment process or 500 ppmw, whichever value is lower.

The advantages of treatment alternative 5 are that a limited number of waste determinations needed, data on flow rate and organic mass are not needed, and waste determinations are limited to wastes entering and exiting the treatment unit rather than at the point of waste origination. This alternative does not require a 95 percent reduction for every influent waste stream.

5.6.6 Treatment Alternative 6

This alternative is referred to as the organic reduction efficiency and waste concentration limit. If the organic reduction efficiency (R) for the treatment process is greater than or equal to 95 percent and the VO concentration of each of the hazardous waste streams entering the process is certified by the owner or operator to be less than 10,000 ppmw at the point of waste origination, then air emission controls are no longer required under the Subpart CC regulations for the waste streams exiting the treatment process. The organic reduction efficiency is calculated using the organic mass flow entering and exiting the treatment unit as described above in Section 5.5.6.

The advantages of this alternative are that a limited number of waste determinations and locations are required to demonstrate that the criteria are met. This alternative may be appropriate for those cases where a large number of waste streams are combined for central treatment.

5.6.7 Treatment Alternative 7

This alternative applies to wastes which are treated in a harzardous waste incinerator. If the owner or operator has a final permit under 40 CFR 270 and meets the requirements of 40 CFR 264, Subpart O, or if the owner or operator has certified compliance with the interim status requirements of 40 CFR 265, Subpart O, then any waste stream exiting these combustion processes would not require air emission control under Subpart CC.

The most important advantages to this alternative are that no VO waste determinations are required to show compliance and no data on flow rate or organic mass is required. Also, no dedicated treatment equipment is required.

5.6.8 Treatment Alternative 8

The final treatment alternative is referred to as the boilers and industrial furnaces alternative because it uses boilers or industrial furnaces to destroy the organics in the wastestream. If the owner or operator has a permit under 40 CFR 270 and meets the requirements of 40 CFR 266.103, or if the owner or operator has certified compliance with the interim status requirements of 40 CFR 266, Subpart H, then waste streams exiting these treatment units are not subject to the Subpart CC air emission controls.

Similar to alternative 7, advantages for this alternative are that no volatile organic waste determinations are required to show compliance, no data on flow rate or organic mass are required, and no dedicated treatment equipment is required.

5.7 Surface Impoundments (40 CFR 264.1085)

Surface Impoundments for which all hazardous waste entering the unit has an average CO concentration at the point of waste origination of less than 500 parts per million by weight (ppmw) must control air pollutant emissions by installing either of the following: (1) a floating membrane cover; or (2) a cover that is vented through a closed-vent system to a control device.

An owner or operator may control air pollutant emissions from a surface impoundment using a floating membrane cover which floats on the liquid surface during normal operations, forms a continuous barrier over the entire surface area of the liquid and is fabricated from synthetic membrane materials.

5.7.1 Control Devices - Floating Membrane Cover (40 CFR 264.1085(c))

The floating membrane cover is installed in a manner such that there are no visible cracks, holes, gaps, or other open spaces between cover section seams or between the interface of the cover edge and its foundation. Whenever a hazardous waste is in the surface impoundment, the floating membrane cover floats on the liquid and each closure device is secured in the closed position except (a) to provide access for performing routine maintenance, inspection, and other normal operations activities or (b) to remove accumulated sludge or other residues from the bottom of surface impoundment. Once the activity is completed, the cover shall be promptly replaced and the closure device secured. A safety device may be opened when conditions require doing so to avoid an unsafe condition.

The cover may be equipped with one or more emergency cover drains for removal of stormwater. Each shall be equipped with a slotted membrane fabric cover that covers at least 90 % of the area of the opening or a flexible fabric sleeve seal.

Acceptable cover devices are made of suitable materials that will minimize exposure of the hazardous waste to the atmosphere, the extent practical, and which maintain the integrity of the closure devices throughout their intended service life. The synthetic membrane material used for the floating membrane cover can be a high density polyethylene (HDPE) or a equivalent material. The HDPE must have a thickness of no less than 2.5 milliliters (mm). If a material or a composite of different materials is used, the material will need to have both organic permeability properties that are equivalent to those of HDPE and physical and chemical properties that maintain the material integrity for the intended service life of the material.

5.7.2 Control Devices - Cover Vented

The owner or operator who controls air pollutant emissions using a cover vented to a control device there are certain requirements that must be met.

The surface impoundment shall have a cover and vented directly through a closed-vent system to a control device. The cover and its closure devices shall be designed to form a continuous barrier over the entire surface area of the liquid in the surface impoundment.

Each opening in the cover which is not vented to the control device shall be equipped with a closure device. The pressure in the vapor headspace underneath the cover as it relates to the atmospheric pressure in the vapor headspace when the closure device is operating must be determined to identify additional requirements. If the pressure is less than the atmospheric pressure, the closure device must be designed to operate such that when the closure device is secured in the closed position no visible cracks, holes, gaps or other open spaces in the closure devices or between the perimeter of the cover opening and the closure device. If the pressure is equal to or greater than atmospheric pressure when the control device is operating, the closure device shall be designed to operate with no detectable organic emissions use Method 21 of 40 CFR Part 60, Appendix A. The test is performed when the unit contains hazardous waste with an organic concentration representative of the range of concentrations for the hazardous waste expected to be managed in the unit. Ensure that the cover and closure devices are secured in the closed position during the test. The detection equipment should be calibrated each day it is used and must meet the performance criteria of Method 21, with one exception. The instrument response factor criteria in section 3.1.2(a) of Method 21 shall be for the average composition of the organic constituents in the hazardous waste placed in the waste management unit, not for each individual organic constituent.

5.7.2.1 Material of Construction

The cover and its closure devices shall be made of suitable materials that will minimize exposure of hazardous waste to the atmosphere, to the extent practical, and will maintain integrity of the cover and closure devices throughout their intended service life. The factors to be considered when selecting the materials of construction and designing the cover and closed devices shall include: Organic vapor permeability; the effects of any contact with the liquid or its vapors managed in the surface impoundment; the effects of outdoor exposure to wind, moisture, and sunlight; and the operating practices used for the surface impoundment on which the cover is installed.

The closed-vent system and control device shall be designed and operated to comply with the Subpart CC Standards for Closed-vent systems and control devices. The standards require that closed-vent system shall route gases, vapors, and fumes emitted from the hazardous waste in the unit to a control device. The control device can be one of the following three: (1) Designed and operated to reduce the total organic content of the inlet vapor stream vented to the control device by at least 95 percent by weight; (2) An enclosed combustion device designed and operated to reduce the organic emissions vented to it by 95 weight percent or greater; to achieve a total organic compound concentration of 20 ppmv; or (3) A flare designed and operated with no visible emissions (as determined by Method 22 in 40 CFR part 60) except for periods not to exceed a total of 5 minutes any 2 consecutive hours.

The closed vent system shall be designed and operated with no detectable emissions, as indicated by an instrument reading of less than 500 ppmv above background (as determined by Method 21), and by visual inspection. Alternatively, the closed-vent system can be designed and operated at a pressure below atmospheric pressure. The system shall be equipped with at least one pressure gauge or other pressure measurement device that can be read from a readily accessible location. The pressure measurement must verify that negative pressure is being maintained in the closed-vent system when the control device is operating.

Whenever hazardous waste is in the surface impoundment, the cover shall be installed with each closure device secured in the closed position and the vapor headspace underneath the cover vented to the control device. Venting to the control device is not required, and opening of closure devices or removal of the cover is allowed to provide access to the surface impoundment for performing routine maintenance, or other activities need for normal operations or to remove accumulated sludge or other residues from the bottom of the surface impoundment.

The safety device may be opened at any time conditions require doing so to avoid unsafe conditions.

The floating membrane or the cover and its closure devices are inspected through visual inspection to check for defects. *Defects* include but are not limited to visible cracks, holes, or gaps in the cover section seams or between the interface of the cover edge and its foundation mountings; broken cracked, or otherwise damaged seals or gaskets on closure devices; and broken or missing hatches, access covers, caps, or other closure devices.

5.7.3 Inspections

An *initial inspection* of the floating membrane cover and its closure devices is preformed on or before the date that the surface impoundment becomes subject to Subpart CC. Thereafter, inspections shall be performed at least once every year except for the special conditions where the inspection or monitoring of the cover would expose a worker to dangerous, hazardous or other unsafe conditions. In such cases, subsequent inspections may be performed at intervals longer than 1 year, provided that the owner or operations designate the cover as an “unsafe to inspect and monitor cover” and provide a written explanation and develop and implement a written plan and schedule to inspection and monitor. The written explanation shall state the reasons why the cover is unsafe to visually inspect or to monitor. The written plan and schedule to inspect and monitor shall utilize procedures in the applicable sections of Subpart CC as frequently as practicable during those times when a worker can safely access the cover.

In the event that a defect is detected, the owner or operator shall repair the defect. The first efforts to repair the defect should be made within 5 calendar days after detection and the repair shall be completed as soon as possible but no later than 45 calendar days after detection. This period may be delayed if the repair of the defect requires emptying or temporary removal from service of the surface impoundment and no alternative capacity is available at the site to accept the hazardous waste normally managed in the surface impoundment. The repair of the defect must take place next time the process or unit that is generating the hazardous waste managed, stops operation. The repair is then need to be completed before the process or unit resumes operations.

6.0 IMPLEMENTATION ISSUES WITH SUBPART CC

One of the major implementation issues associated with Subpart CC and the other RCRA Organic Air Emission Standards is the lack of detailed permit conditions. Often times the permit condition states simply that the facility must comply with Subparts AA, BB and CC. This is not sufficient. Permit conditions must be unit specific. EPA Region 4 has developed a Model Permit to be used as a starting point for developing site-specifc permit conditions. In addition, an example of a site specfic permit from EPA Region 8 has also been provided.

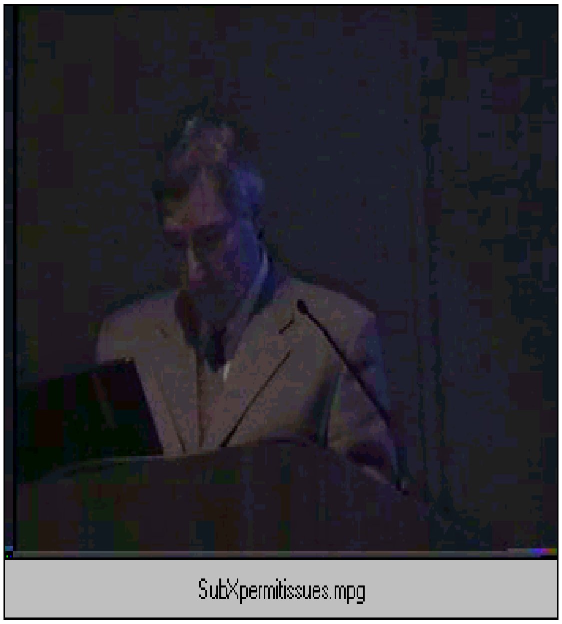
Another issue is the lack of facility awareness regarding the regulations. Often, the facility mistakenly believes that units are exempt from the regulations due to overlap with the CAA or other RCRA exemptions. These units are often not identified in the permit application or go unnoticed until an inspection. EPA Region 2 has developed a 3007 Information Request which may be useful in identifying those units which require permitting. Another tool that has been developed for the permit writer is a template of notice of deficiency comments which may be used during the permit application review process to obtain additional information.

Lastly, many facilities are not aware that the RCRA Subpart CC regulations also apply to Subpart X or miscellaneous units. Subpart X units need to be considered from a total emissions or mass-balance standpoint when evaluating controls. A single waste stream into a Subpart X unit can create several waste, air or other side streams which need to be evaluated for the unit's impact on human health and the environment. For example, if the Subpart X unit is similiar to a tank, and the tank standards (only) are applied, the permit writer may be ignoring the air emissions from the side streams which would not exist if it were not for the Subpart X unit. Under these circumstances, the permit writer has the authority to require control of the emissions, which in many cases are quite significant. Quantification of all emissions by the facility may identify side streams which require air emission control, which can then be controlled by specific language in the RCRA permit.

The air emissions associated with waste transfers need to be considered in detail when establishing permit conditions. Waste transfers can be a large source of air emissions, and both Subpart X and the Omnibus authority give permit writers the authority needed to control the emissions. Due to the significant potential for leaks from units operated under pressure, leak detection monitoring should be required on a frequent basis, and repair of leaks required consistent with the schedule in

Subpart BB. This will result in greater human health and environmental protection at RCRA facilities.

Remember that Subpart X requires that all media be addressed for impacts, so if the air emission standards are not appropriate toward the unit but releases may be a concern, then the air assessment can address the issues.



To hear more about Subpart X and Subpart CC click on the highlighted text Subpart X Permit Issues.

APPENDIX A

Table of Compounds With Henry's Law Constant Less Than 0.1 Y/X

[40 CFR 265, Appendix VI]

Compounds With Henry's Law Constant Less Than 0.1 Y/X
[40 CFR 265, Appendix VI]
Appendix A

Compound Name	CAS No. [1]
Acetaldol	107-89-1
Acetamide.	60-35-5
2-Acetylaminofluorene	53-96-3
3-Acetyl-5-hydroxypiperidine.	
3-Acetylpiperidine	618-42-8
1-Acetyl-2-thiourea	591-08-2
Acrylamide	79-06-1
Acrylic acid	79-10-7
Adenine	73-24-5
Adipic acid	124-04-9
Adiponitrile	111-69-3
Alachlor	15972-60-8
Aldicarb	116-06-3
Ametryn.	834-12-8
4-Aminobiphenyl.	92-67-1
4-Aminopyridine	504-24-5
Aniline.	62-53-3
o-Anisidine	90-04-0
Anthraquinone	84-65-1
Atrazine	1912-24-9
Benzenearsonic acid	98-05-5
Benzenesulfonic acid	98-11-3
Benzidine	92-87-5
Benzo(a)anthracene	56-55-3
Benzo(k)fluoranthene	207-08-9
Benzoic acid	65-85-0
Benzo(g,h,i)perylene	191-24-2
Benzo(a)pyrene	50-32-8
Benzyl alcohol	100-51-6
gamma-BHC	58-89-9
Bis(2-ethylhexyl)phthalate	117-81-7
Bromochloromethyl acetate.	
Bromoxynil	1689-84-5
Butyric acid	107-92-6
Caprolactam (hexahydro-2H-azepin-2-one)	105-60-2
Catechol (o-dihydroxybenzene)	120-80-9
Cellulose	9004-34-6
Cell wall.	
Chlorhydrin (3-Chloro-1,2-propanediol)	96-24-2
Chloroacetic acid	79-11-8
2-Chloroacetophenone	93-76-5
p-Chloroaniline	106-47-8

Compounds With Henry's Law Constant Less Than 0.1 Y/X
[40 CFR 265, Appendix VI] (Cont'd)
Appendix A

Compound Name	CAS No. [1]
p-Chlorobenzophenone	134-85-0
Chlorobenzilate	510-15-6
p-Chloro-m-cresol (6-chloro-m-cresol)	59-50-7
3-Chloro-2,5-diketopyrrolidine.	
Chloro-1,2-ethane diol.	
4-Chlorophenol	106-48-9
Chlorophenol polymers (2-chlorophenol & 4-chlorophenol)	95-57-8 &
	106-48-9
1-(o-Chlorophenyl)thiourea	5344-82-1
Chrysene	218-01-9
Citric acid	77-92-9
Creosote	8001-58-9
m-Cresol	108-39-4
o-Cresol	95-48-7
p-Cresol.	106-44-5
Cresol (mixed isomers)	1319-77-3
4-Cumylphenol	27576-86
Cyanide	57-12-5
4-Cyanomethyl benzoate.	
Diazinon	333-41-5
Dibenzo(a,h)anthracene	53-70-3
Dibutylphthalate	84-74-2
2,5-Dichloroaniline (N,N'-dichloroaniline)	95-82-9
2,6-Dichlorobenzonitrile11	1194-65-6
2,6-Dichloro-4-nitroaniline.	99-30-9
2,5-Dichlorophenol	333-41-5
3,4-Dichlorotetrahydrofuran	3511-19
Dichlorvos (DDVP)	62737
Diethanolamine	111-42-2
N,N-Diethylaniline	91-66-7
Diethylene glycol	111-46-6
Diethylene glycol dimethyl ether (dimethyl Carbitol)	111-96-6
Diethylene glycol monobutyl ether (butyl Carbitol)	112-34-5
Diethylene glycol monoethyl ether acetate (Carbitol acetate)	112-15-2
Diethylene glycol monoethyl ether (Carbitol Cellosolve)	111-90-0
Diethylene glycol monomethyl ether (methyl Carbitol)	111-77-3
N,N'-Diethylhydrazine	1615-80-1
Diethyl (4-methylumbelliferyl) thionophosphate	299-45-6
Diethyl phosphorothioate	126-75-0
N,N'-Diethylpropionamide	15299-99-7
Dimethoate	60-51-5
2,3-Dimethoxystrychnidin-10-one	357-57-3

Compounds With Henry's Law Constant Less Than 0.1 Y/X
[40 CFR 265, Appendix VI] (Cont'd)
Appendix A

Compound Name	CAS No.[1]
4-Dimethylaminoazobenzene	60-11-7
7,12-Dimethylbenz(a)anthracene	57-97-6
3,3-Dimethylbenzidine	119-93-7
Dimethylcarbamoyl chloride	79-44-7
Dimethyldisulfide	624-92-0
Dimethylformamide	68-12-2
1,1-Dimethylhydrazine	57-14-7
Dimethylphthalate	131-11-3
Dimethylsulfone	67-71-0
Dimethylsulfoxide.	67-68-5
4,6-Dinitro-o-cresol	534-52-1
1,2-Diphenylhydrazine	122-66-7
Dipropylene glycol (1,1'-oxydi-2-propanol)	110-98-5
Endrin	72-20-8
Epinephrine	51-43-4
mono-Ethanolamine	141-43-5
Ethyl carbamate (urethane)	5-17-96
Ethylene glycol	107-21-1
Ethylene glycol monobutyl ether (butyl Cellosolve)	111-76-2
Ethylene glycol monoethyl ether (Cellosolve)	110-80-5
Ethylene glycol monoethyl ether acetate (Cellosolve acetate)	111-15-9
Ethylene glycol monomethyl ether (methyl Cellosolve)	109-86-4
Ethylene glycol monophenyl ether (phenyl Cellosolve)	122-99-6
Ethylene glycol monopropyl ether (propyl Cellosolve)	2807-30-9
Ethylene thiourea (2-imidazolidinethione)	9-64-57
4-Ethylmorpholine	100-74-3
3-Ethylphenol.	620-17-7
Fluoroacetic acid, sodium salt	62-74-8
Formaldehyde.	50-00-0
Formamide	75-12-7
Formic acid	64-18-6
Fumaric acid	110-17-8
Glutaric acid	110-94-1
Glycerin (Glycerol)	56-81-5
Glycidol	556-52-5
Glycinamide	598-41-4
Glyphosate	1071-83-6
Guthion	86-50-0
Hexamethylene-1,6-diisocyanate (1,6-diisocyanatohexane)	822-06-0
Hexamethyl phosphoramide	680-31-9
Hexanoic acid	142-62-1
Hydrazine	302-01-2

Compounds With Henry's Law Constant Less Than 0.1 Y/X
[40 CFR 265, Appendix VI] (Cont'd)
Appendix A

Compound Name	**CAS No.** [1]
Hydrocyanic acid	74-90-8
Hydroquinone	123-31-9
Hydroxy-2-propionitrile (hydracrylonitrile)	109-78-4
Indeno (1,2,3-cd) pyrene	193-39-5
Lead acetate	301-04-2
Lead subacetate (lead acetate, monobasic)	1335-32-6
Leucine	61-90-5
Malathion	121-75-5
Maleic acid	110-16-7
Maleic anhydride	108-31-6
Mesityl oxide	141-79-7
Methane sulfonic acid	75-75-2
Methomyl	16752-77-5
p-Methoxyphenol	150-76-5
Methyl acrylate	96-33-3
4,4'-Methylene-bis-(2-chloroaniline)	101-14-4
4,4'-Methylenediphenyl diisocyanate (diphenyl methane diisocyanate)	101-68-8
4,4'-Methylenedianiline	101-77-9
Methylene diphenylamine (MDA).	
5-Methylfurfural	620-02-0
Methylhydrazine	60-34-4
Methyliminoacetic acid.	
Methyl methane sulfonate	66-27-3
1-Methyl-2-methoxyaziridine.	
Methylparathion	298-00-0
Methyl sulfuric acid (sulfuric acid, dimethyl ester)	77-78-1
4-Methylthiophenol	106-45-6
Monomethylformamide (N-methylformamide)	123-39-7
Nabam	142-59-6
alpha-Naphthol	90-15-3
beta-Naphthol.	135-19-3
alpha-Naphthylamine	134-32-7
beta-Naphthylamine	91-59-8
Neopentyl glycol (dimethylolpr)	126-30-7
Niacinamide	98-92-0
o-Nitroaniline	88-74-4
Nitroglycerin.	55-63-0
2-Nitrophenol	88-75-5
4-Nitrophenol	100-02-7
N-Nitrosodimethyla	62-75-9
Nitrosoguanidine	674-81-7
N-Nitroso-n-methylurea	684-93-5

Compounds With Henry's Law Constant Less Than 0.1 Y/X [40 CFR 265, Appendix VI] (Cont'd)
Appendix A

Compound Name	CAS No. [1]
N-Nitrosomorpholine (4-nitrosomorpholine)	59-89-2
Oxalic acid	144-62-7
Parathion	56-38-2
Pentaerythritol.	115-77-5
Phenacetin.	62-44-2
Phenol	108-95-2
Phenylacetic acid	103-82-2
m-Phenylene diamine	108-45-2
o-Phenylene diamine	95-54-5
p-Phenylene diamine	106-50-3
Phenyl mercuric acetate	62-38-4
Phorate	298-02-2
Phthalic anhydride	85-44-9
alpha-Picoline (2-methyl pyridine)	109-06-8
1,3-Propane sulfone	1120-71-4
beta-Propiolactone	57-57-8
Proporur (Baygon).	
Propylene glycol	57-55-6
Pyrene	129-00-0
Pyridinium bromide.	39416-48-3
Quinoline	91-22-5
Quinone (p-benzoquinone)	106-51-4
Resorcinol	108-46-3
Simazine	122-34-9
Sodium acetate	127-09-3
Sodium formate	141-53-7
Strychnine	57-24-9
Succinic acid	110-15-6
Succinimide	123-56-8
Sulfanilic acid	121-47-1
Terephthalic acid	100-21-0
Tetraethyldithiopyrophosphate	3689-24-5
Tetraethylenepentamine	112-57-2
Thiofanox	39196-18-4
Thiosemicarbazide	79-19-6
2,4-Toluenediamine	95-80-7
2,6-Toluenediamine	823-40-5
3,4-Toluenediamine	496-72-0
2,4-Toluene diisocyanate	584-84-9
p-Toluic acid	99-94-5
m-Toluidine	108-44-1
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1

Compounds With Henry's Law Constant Less Than 0.1 Y/X [40 CFR 265, Appendix VI] (Cont'd)

Appendix A

Compound Name	**CAS No.** [1]
Triethanolamine	102-71-6
Triethylene glycol dimethyl ether.	
Tripropylene glycol	24800-44-0
Warfarin	81-81-2
3,4-Xylenol (3,4-dimethylphenol)	95-65-8

[1] Chemical Abstract Services Number

Appendix B

Fraction Measured (F_m) and Fraction Emitted (F_e) for HAP Compounds in Wastewater Streams (Source: 40 CFR 63, Subpart G, Table 34)

Fraction Measured (F_m) and Fraction Emitted (F_e) for HAP Compounds in Wastewater Streams (Source: 40 CFR 63, Subpart G, Table 34)

Appendix B

Chemical name	CAS Number[a]	F_m	F_e
Acetaldehyde	75070	1.00	0.48
Acetonitrile	75058	0.99	0.36
Acetophenone	98862	0.31	0.14
Acrolein	107028	1.00	0.43
Acrylonitrile	107131	1.00	0.43
Allyl chloride	107051	1.00	0.89
Benzene	71432	1.00	0.80
Benzyl chloride	100447	1.00	0.47
Biphenyl	92524	0.86	0.45
Bromoform	75252	1.00	0.49
Butadiene (1,3-)	106990	1.00	0.98
Carbon disulfide	75150	1.00	0.92
Carbon tetrachloride	56235	1.00	0.94
Chlorobenzene	108907	1.00	0.73
Chloroform	67663	1.00	0.78
Chloroprene (2-Chloro-1,3-butadiene)	126998	1.00	0.68
Cumene	98828	1.00	0.88
Dichlorobenzene (p-)	106467	1.00	0.72
Dichloroethane (1,2-) (Ethylene dichloride)	107062	1.00	0.64
Dichloroethyl ether (Bis(2-Chloroethyl ether))	111444	0.76	0.21
Dichloropropene (1,3-)	542756	1.00	0.76
Diethyl sulfate	64675	0.0025	0.11
Dimethyl sulfate	77781	0.086	0.079
Dimethylaniline (N,N-)	121697	0.00080	0.34
Dimethylhydrazine (1,1-)	57147	0.38	0.054
Dinitrophenol (2,4-)	51285	0.0077	0.060
Dinitrotoluene (2,4-)	121142	0.085	0.18
Dioxane (1,4-) (1,4-Diethyleneoxide)	123911	0.87	0.18
Epichlorohydrin(1-Chloro-2,3-epoxypropane)	106898	0.94	0.35
Ethyl acrylate	140885	1.00	0.48
Ethylbenzene	100414	1.00	0.83
Ethyl chloride (Chloroethane)	75003	1.00	0.90
Ethylene dibromide (Dibromomethane)	106934	1.00	0.57
Ethylene glycol dimethyl ether	110714	0.86	0.32
Ethylene glycol monobutyl ether acetate	112072	0.043	0.067
Ethylene glycol monomethyl ether acetate	110496	0.093	0.048
Ethylene oxide	75218	1.00	0.50
Ethylidene dichloride (1,1-Dichloroethane)	75343	1.00	0.79
Hexachlorobenzene	118741	0.97	0.64

Fraction Measured (F_m) and Fraction Emitted (F_e) for HAP Compounds in Wastewater Streams (Source: 40 CFR 63, Subpart G, Table 34)

Appendix D

Chemical name	CAS Number[a]	F_m	F_e
Hexachlorobutadiene	87683	0.88	0.86
Hexachloroethane	67721	0.50	0.85
Hexane	110543	1.00	1.00
Isophorone	78591	0.51	0.11
Methanol	67561	0.85	0.17
Methyl bromide (Bromomethane)	74839	1.00	0.85
Methyl chloride (Chloromethane)	74873	1.00	0.84
Methyl ethyl ketone (2-Butanone)	78933	0.99	0.48
Methyl isobutyl ketone (Hexone)	108101	0.98	0.53
Methyl methacrylate	80626	1.00	0.37
Methyl tert-butyl ether	1634044	1.00	0.57
Methylene chloride (Dichloromethane)	75092	1.00	0.77
Naphthalene	91203	0.99	0.51
Nitrobenzene	98953	0.39	0.23
Nitropropane (2-)	79469	0.99	0.44
Phosgene	75445	1.00	0.87
Propionaldehyde	123386	1.00	0.41
Propylene dichloride (1,2-Dichloropropane)	78875	1.00	0.72
Propylene oxide	75569	1.00	0.60
Styrene	100425	1.00	0.80
Tetrachloroethane (1,1,2,2-)	79345	1.00	0.46
Tetrachloroethylene (Perchloroethylene)	127184	1.00	0.92
Toluene	108883	1.00	0.80
Toluidine (o-)	95534	0.15	0.052
Trichlorobenzene (1,2,4-)	120821	1.00	0.64
Trichloroethane (1,1,1-) (Methyl chloroform)	71556	1.00	0.91
Trichloroethane (1,1,2-) (Vinyl Trichloride)	79005	1.00	0.60
Trichloroethylene	79016	1.00	0.87
Trichlorophenol (2,4,5-)	95954	0.11	0.086
Triethylamine	121448	1.00	0.38
Trimethylpentane (2,2,4-)	540841	1.00	1.00
Vinyl acetate	108054	1.00	0.59
Vinyl chloride (Chloroethylene)	75014	1.00	0.97
Vinylidene chloride (1,1-Dichloroethylene)	75354	1.00	0.94
Xylene (m-)	108383	1.00	0.82
Xylene (o-)	95476	1.00	0.79
Xylene (p-)	106423	1.00	0.82

---

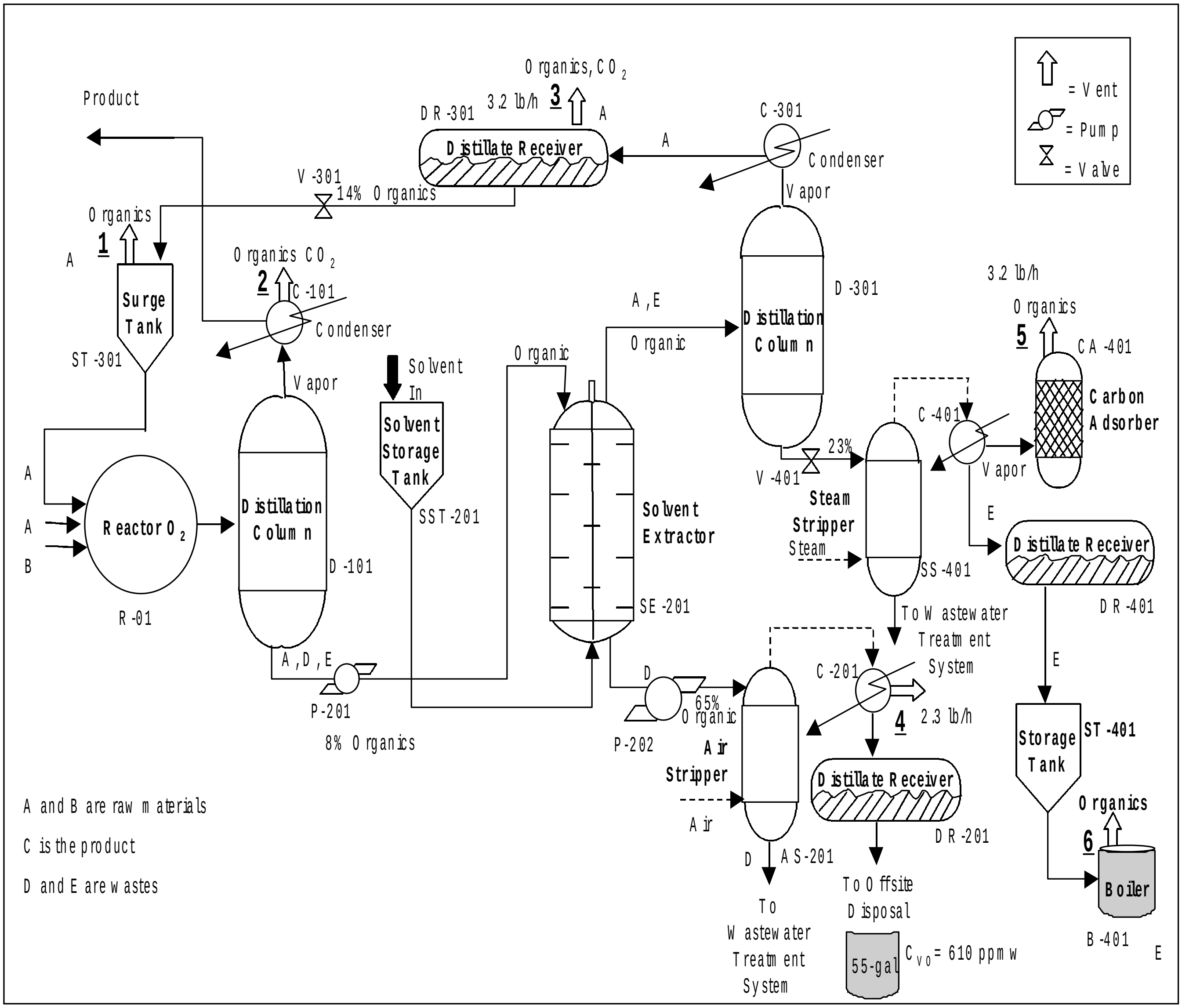
[a] CAS numbers refer to the Chemical Abstracts Service registry number assigned to specific compounds, isomers, or mixtures of compounds.

APPENDIX C

Case Studies and Answers

CASE STUDY - APPLICABILITY
SUBPARTS AA, BB, AND CC
Appendix C

Schematic of XYZ Chemical Corporation Manufacturing Process



CASE STUDY - APPLICABILITY
SUBPARTS AA, BB, AND CC
Appendix C

Manufacturing Process Description

XYZ Chemical Company is a permitted RCRA facility which manufactures 50,000 tons/yr of product. Approximately 1,800 tons of hazardous waste is produced per year. During the manufacturing process the unreacted manufacturing constituent is recycled to the main reactor. All waste managed have organic concentrations greater than 10 ppmw.

Questions

Using the schematic provided for XYZ Chemical, answer the following questions:

1. Six process vents are identified in the schematic. The emission rate associated with each vent is provided next to the vent. For each vent, determine the applicability of the Subpart AA regulations and provide the basis for your determination. Note: for the first part of this case study ignore the carbon adsorber associated with the steam stripper. The process vent is from the condenser at a rate of 3.2 lb/h.

2. A carbon adsorber was added after the condenser associated with Vent #5. After installing the carbon adsorber, XYZ monitored emissions at Vent #5 and have reported results of 0.05 lb/h. Make a determination as to the compliance status of XYZ considering the addition of the carbon adsorption system.

3. What additional actions should XYZ Chemical Company take in order to comply with Subpart AA regulations?

4. There are many pieces of equipment associated with the XYZ manufacturing process, however, for the purposes of this case study, only four pieces of equipment are identified on the schematic. Make a determination on the applicability of Subpart BB for the two valves and two pumps identified. The organic composition of the flow through the equipment is identified on the schematic

5. There are two tanks associated with this manufacturing process. Method 25D was used by XYZ to determine the volatile organic concentrations in the tank. Determine the applicability of Subpart CC for the surge tank and the storage tank. Provide the basis for your determination.

6. The waste leaving the distillate receiver is collected in 55-gallon containers. XYZ determined the volatile organic concentration of the waste at the point of origination to equal 610 ppmw. Are these containers subject to Subpart CC? Provide your justification for your determination.

7. What would be required of the facility if the containers meet DOT regulations?

CASE STUDY - APPLICABILITY
SUBPARTS AA, BB, AND CC
Appendix C

ANSWERS

1. The following vents are subject to Subpart AA regulations:

Vent #4: The exhaust gases from the condenser serving the air stripper are considered a process vent. Emission from the control device are directly related to the air stripping operations.

Vent #5: The exhaust gases from the condenser serving the steam stripper are considered a process vent. Emission from the control device are directly related to the steam stripping operations.

The following vents are **not** subject to Subpart AA regulations:

Vent #1: The vent on the surge tank is not subject to Subpart AA regulations since it does not meet the definition of a process vent as specified in the rule. The tank emissions are not process related.

Vent #2: This unit is a part of the manufacturing operations, therefore, under 40 CFR 261.4 (c) a hazardous waste that is regulated in a manufacturing process unit is not subject to regulations under Parts 262 through 265 until it exits the unit in which it was generated, unless the hazardous waste remains in the unit more than 90 days after the unit ceases to be operated for manufacturing. Therefore, because the unit is not subject to RCRA permitting, the vent on this unit is not subject to the Subpart AA process vent regulations.

Vent #3: The vent on the distillate receiver is not subject to Subpart AA. Under 40 CFR 261.3(c)(2)(1), the definition of hazardous waste materials that are reclaimed from solid waste and that are used beneficially are not solid wastes and hence are not hazardous waste unless reclaimed material is burned for energy recovery or used in a manner constituting disposal.

Vent #6: The vent from the boiler used to burn the hazardous waste is not subject to Subpart AA because the boiler is not one of the unit operations specified in the rule.

2. Prior to the installation of the carbon adsorption system, the total organic emissions from the process vents was:

Total Emission Rate = $ER_4 + ER_5$
Total Emission Rate = 2.3 lb/h + 0.05 lb/h = 2.35lb/h

The total organic emission rate from the process vents is below 3 lb/h, therefore, the facility is now in compliance with Subpart AA. The total organic emissions from process vent #4 was also reduced by over 95%.

CASE STUDY - APPLICABILITY
SUBPARTS AA, BB, AND CC
Appendix C

ANSWERS

3. The facility is in compliance with Subpart AA regulations with the installation of the carbon adsorber. No further action is required.

4. The following equipment is subject to Subpart BB:

Pump (P-202): This pump is associated with a waste stream that contacts hazardous waste with organic concentrations of at least 10 percent by weight.

Valve (V-401): This valve is associated with a waste stream that contact hazardous waste with organic concentrations of at least 10 percent by weight.

The following equipment is **not** subject to Subpart BB:

Pump (P-201): The pump contacts a stream which contains mostly compound A, which will be reclaimed. Under 40 CFR 261.3(c)(2)(1), the definition of hazardous waste materials that are reclaimed from solid waste and that are used beneficially are not solid wastes and hence, are not hazardous waste unless reclaimed material is burned for energy recovery or used in a manner constituting disposal.

Valve (V-301): The valve contacts a stream primarily composed of compound A, which will be reclaimed. Under 40 CFR 261.3(c)(2)(1), the definition of hazardous waste materials that are reclaimed from solid waste and that are used beneficially are not solid wastes and hence, are not hazardous waste unless reclaimed material is burned for energy recovery or used in a manner constituting disposal.

5. The surge tank is **not** subject to Subpart CC regulations because it contains compound A, which will be reclaimed. Under 40 CFR 261.3(c)(2)(1), the definition of hazardous waste materials that are reclaimed from solid waste and that are used beneficially are not solid wastes and hence, are not hazardous waste unless reclaimed material is burned for energy recovery or used in a manner constituting disposal.

The storage tank is subject to Subpart CC regulations because it contains hazardous waste with a volatile organic concentration greater than 500 ppmw.

6. The containers are subject to Subpart CC regulations because they contain hazardous waste with volatile organic concentration greater than 500 ppmw.

The facility would be required to keep covers on all openings and closure devices. Transferring of waste should be done as quickly as possible and if batch operation cover should be in place when no more waste will be added within 15 minutes.

Case Study - Waste Determination
Appendix C
Controls For Tanks, Surface Impoundments and Containers
Method 25D

Facility Information: The XYZ Chemical Company has one fixed-roof tank (T-201) that contains mixed waste. XYZ will collect four samples to be analyzed by **Method 25D** to calculate the average volatile organic concentration of this waste. The waste is generated from the bottoms portion of a distillation column (D-202) in the solvent reclamation area of the facility. The waste samples will also be collected from valve (V-204). This valve opens the line leading from the distillation column to tank (T-201).

The four samples will be collected on four different dates. The first date occurring in early December, the next collected in April, the third in July and the final in November. For each sample collected, 10 grams of waste will be collected in wide mouth glass vials preserved with 30-ml of polyethylene glycol. The containers will be kept on ice until the samples are collected. Once the sample has been collected the sample will be returned to the ice as soon as practicable, in order to prevent volatilization. One trip blank will be collected each time a sample is collected. Two sets of duplicate samples and two sets of MS/MSD samples will also be collected. A duplicate or matrix spike sample/matrix spike duplicate set will accompany each sample to the laboratory. ABC Laboratories in Chemistry, New Mexico will analyze the samples.

Review the data to insure that the XYZ Chemical Company does not have to place Subpart CC controls on the fixed-roof tank. The discrete mass quantities for each sampling period are as follows:

Q_j = 750 kg/hr (for period when XYZ-01-SS was collected)
Q_j = 725 kg/hr (for period when XYZ-02-SS was collected)
Q_j = 640 kg/hr (for period when XYZ-03-SS was collected)
Q_j = 715 kg/hr (for period when XYZ-04-SS was collected)

FORM 1 VOA
METHOD 25D ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs	XYZ-01-SS
Lab Code: 11143	SDG No.: XY-9345
Matrix (soil/water): waste	Lab Sample ID: XY-9345-1
Sample wt/vol: 10 (g/mL) g	Date Received: 13-Dec-96
Level: (low/med) LOW	Date Analyzed: 16-Dec-96

Compounds
Concentration (ppmw)

Total Chlorine as Chloride	298
Total Carbon as Methane	158

Case Study - Waste Determination
Appendix C
Controls For Tanks, Surface Impoundments and Containers
Method 25D

FORM 1 VOA
METHOD 25D ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs
Lab Code: 11143
Matrix (soil/water): waste
Sample wt/vol: 10 (g/mL) g
Level: (low/med) LOW

XYZ-02-SS
SDG No.: XY-9442
Lab Sample ID: XY-9442-2
Date Received: 10-Apr-97
Date Analyzed: 15-Apr-97

Compounds

Concentration (ppmw)

Total Chlorine as Chloride
253
Total Carbon as Methane
158

FORM 1 VOA
METHOD 25D ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs
Lab Code: 11143
Matrix (soil/water): waste
Sample wt/vol: 10 (g/mL) g
Level: (low/med) LOW

XYZ-03-SS
SDG No.: XY-9533
Lab Sample ID: XY-9533-1
Date Received: 18-Jul-97
Date Analyzed: 25-Jul-97

Compounds
Concentration (ppmw)

Total Chlorine as Chloride	310
Total Carbon as Methane	168

Case Study - Waste Determination
Appendix C

FORM 1 VOA
METHOD 25D ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs XYZ-04-SS
Lab Code: 11143 SDG No.: XY-9677
Matrix (soil/water): waste Lab Sample ID: XY-9677-1
Sample wt/vol: 10 (g/mL) g Date Received: 20-Nov-97
Level: (low/med) LOW Date Analyzed: 22-Nov-97

Compounds
Concentration (ppmw)

Total Chlorine as Chloride	285
Total Carbon as Methane	155

Case Study - Waste Determination
Appendix C
Controls For Tanks, Surface Impoundments and Containers
SW-846 Method 8260
Appendix C

Facility Information: The XYZ Chemical Company has one fixed-roof tank (T-201) that contains mixed waste. XYZ will collect four samples to be analyzed by **SW-846 Method 8260** to calculate the average volatile organic concentration of this waste. The waste is generated from the bottoms portion of a distillation column (D-202) in the solvent reclamation area of the facility. The waste samples will also be collected from valve (V-204). This valve opens the line leading from the distillation column to tank (T-201).

The four samples will be collected on four different dates. The first date occurring in early December, the next collected in April, the third in July and the final in November. For each sample collected, 10 grams of waste be collected in unpreserved wide mouth glass vials. Once the sample has been collected it will be placed on ice as soon as practicable, in order to prevent volatilization. One trip blank will be collected each time a sample is collected. Two sets of duplicate samples and two sets of MS/MSD samples will also be collected. A duplicate or matrix spike sample/matrix spike duplicate set will accompany each sample to the laboratory. ABC Laboratories in Chemistry, New Mexico will analyze the samples.

Review the data to insure that the XYZ Chemical Company does not have to place Subpart CC controls on the fixed-roof tank. The discrete mass quantities for each sampling period are as follows:

Q_j = 750 kg/hr (for period when XYZ-01-SS was collected)
Q_j = 725 kg/hr (for period when XYZ-02-SS was collected)
Q_j = 640 kg/hr (for period when XYZ-03-SS was collected)
Q_j = 715 kg/hr (for period when XYZ-04-SS was collected)

(Hint: Remeber to include half the value of all nondetects in the concentration calculation)

Case Study - Waste Determination (Cont'd)

Appendix C

FORM 1 VOA

EPA 8260 ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs	XYZ-01-SS
Lab Code: 11143	SDG No.: XY-9345
Matrix (soil/water): waste	Lab Sample ID: XY-9345-1
Sample wt/vol: 10 (g/mL) g	Date Received: 13-Dec-96
Level: (low/med) LOW	Date Analyzed: 16-Dec-96
% Moisture: 20	Dilution Factor: 1
GC Column:	ID: 0.53(mm)

CAS No.	Compound	Concentration Units mg/l Q
67-64-1	Acetone	20.0 U
107-13-1	Acrylonitrile	115 -
71-43-2	Benzene	5.00 U
108-86-1	Bromochloromethane	5.00 U
74-97-5	Bromodichloromethane	5.00 U
75-27-4	Bromoform	5.00 U
75-15-0	Carbon disulfide	5.00 U
56-23-5	Carbon tetrachloride	5.00 U
108-90-7	Chlorobenzene	5.00 U
75-00-3	Chloroform	5.00 U
67-66-3	2-Chlorotoluene	5.00 U
95-49-8	4-Chlorotoluene	5.00 U
106-43-4	Dibromochloromethane	5.00 U
110-75-8	1,2-Dibromo-3-chloropropane	5.00 U
75-34-3	1,2-Dibromomethane	5.00 U
156-59-2	1,2-Dichlorobenzene	5.00 U
540-59-0	1,3-Dichlorobenzene	5.00 U
78-87-5	trans-1,2-Dichloroethene	5.00 U
594-20-7	1,2-Dichloropropane	5.00 U
563-58-6	2,2-Dichloropropane	5.00 U
142-28-9	1,1-Dichloropropene	5.00 U
10061-01-5	cis-1,3-Dichloropropane	5.00 U
10061-02-6	trans-1,2-Dichloropropane	5.00 U
100-41-4	Ethylbenzene	5.00 U
591-78-6	2-Hexanone	5.00 U
74-83-9	Bromomethane	20.00 -
74-87-3	Chloromethane	5.00 U
74-95-3	Dibromomethane	75.00 -
78-93-3	2-Butanone	135.00
74-88-4	Iodomethane	5.00 U
75-09-2	Methylene chloride	90.00 -
108-10-1	4-Methyl-2-pentanone	100 U
87-61-6	Styrene	5.00 U
630-20-6	1,1,1,2-Tetrachloroethane	5.00 U
79-34-5	1,1,2,2-Tetrachloroethane	5.00 U
127-18-4	Tetrachloroethene	5.00 U
108-10-1	Toluene	5.00 U

Case Study - Waste Determination (Cont'd)

Appendix C

FORM 1 VOA

EPA 8260 ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs	XYZ-01-SS
Lab Code: 11143	SDG No.: XY-9345
Matrix (soil/water): waste	Lab Sample ID: XY-9345-1
Sample wt/vol: 10 (g/mL) g	Date Received: 13-Dec-96
Level: (low/med) LOW	Date Analyzed: 16-Dec-96
% Moisture: 20	Dilution Factor: 1
GC Column:	ID: 0.53(mm)

CAS No.	Compound	Concentration Units mg/l	Q
87-61-6	1,2,3-Trichlorobenzene	5.00	U
120-82-1	1,2,4-Trichlorobenzene	5.00	U
71-55-6	1,1,1-Trichloroethane	5.00	U
79-00-5	1,1,2-Trichloroethane	5.00	U
79-01-6	Trichloroethene	5.00	U
75-69-4	Trichlorofluoromethane	5.00	U
96-18-4	1,2,3-Trichloropropane	5.00	U
108-05-4	1,3,5-Trimethylbenzene	5.00	U
95-63-6	1,2,4-Trimethylbenzene	5.00	U
108-05-4	Vinyl acetate	50.0	U
75-01-4	Vinyl chloride	2.00	U
108-38-3	m,p-Xylene	5.00	U
95-47-6	o-Xylene	5.00	U

Case Study - Waste Determination (Cont'd)
Appendix C

FORM 1 VOA

EPA 8260 ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs	XYZ-02-SS
Lab Code: 11143	SDG No.: XY-9422
Matrix (soil/water): waste	Lab Sample ID: XY-9422-2
Sample wt/vol: 10 (g/mL) g	Date Received: 10-Apr-97
Level: (low/med) LOW	Date Analyzed: 15-Apr-97
% Moisture: 20	Dilution Factor: 1
GC Column:	ID: 0.53(mm)

CAS No.	Compound	Concentration Units mg/l	Q
67-64-1	Acetone	20.0	U
107-13-1	Acrylonitrile	110.00	-
71-43-2	Benzene	5.00	U
108-86-1	Bromochloromethane	5.00	U
74-97-5	Bromodichloromethane	5.00	U
75-27-4	Bromoform	5.00	U
75-15-0	Carbon disulfide	5.00	U
56-23-5	Carbon tetrachloride	5.00	U
108-90-7	Chlorobenzene	5.00	U
75-00-3	Chloroform	5.00	U
67-66-3	2-Chlorotoluene	5.00	U
95-49-8	4-Chlorotoluene	5.00	U
106-43-4	Dibromochloromethane	5.00	U
110-75-8	1,2-Dibromo-3-chloropropane	5.00	U
75-34-3	1,2-Dibromomethane	5.00	U
156-59-2	1,2-Dichlorobenzene	5.00	U
540-59-0	1,3-Dichlorobenzene	5.00	U
78-87-5	trans-1,2-Dichloroethene	5.00	U
594-20-7	1,2-Dichloropropane	5.00	U
563-58-6	2,2-Dichloropropane	5.00	U
142-28-9	1,1-Dichloropropene	5.00	U
10061-01-5	cis-1,3-Dichloropropane	5.00	U
10061-02-6	trans-1,2-Dichloropropane	5.00	U
100-41-4	Ethylbenzene	5.00	U
591-78-6	2-Hexanone	5.00	U
74-83-9	Bromomethane	25.00	-
74-87-3	Chloromethane	5.00	U
74-95-3	Dibromomethane	60.00	-
78-93-3	2-Butanone	95.00	-
74-88-4	Iodomethane	5.00	U
75-09-2	Methylene chloride	105.00	
108-10-1	4-Methyl-2-pentanone	100	U
87-61-6	Styrene	5.00	U
630-20-6	1,1,1,2-Tetrachloroethane	5.00	U
79-34-5	1,1,2,2-Tetrachloroethane	5.00	U
127-18-4	Tetrachloroethene	5.00	U
108-10-1	Toluene	5.00	U

Case Study - Waste Determination (Cont'd)
Appendix C

FORM 1 VOA

EPA 8260 ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs	XYZ-02-SS
Lab Code: 11143	SDG No.: XY-9422
Matrix (soil/water): waste	Lab Sample ID: XY-9422-2
Sample wt/vol: 10 (g/mL) g	Date Received: 10-Apr-97
Level: (low/med) LOW	Date Analyzed: 15-Apr-97
% Moisture: 20	Dilution Factor: 1
GC Column:	ID: 0.53(mm)

CAS No.	Compound	Concentration Units mg/l	Q
87-61-6	1,2,3-Trichlorobenzene	5.00	U
120-82-1	1,2,4-Trichlorobenzene	5.00	U
71-55-6	1,1,1-Trichloroethane	5.00	U
79-00-5	1,1,2-Trichloroethane	5.00	U
79-01-6	Trichloroethene	5.00	U
75-69-4	Trichlorofluoromethane	5.00	U
96-18-4	1,2,3-Trichloropropane	5.00	U
108-05-4	1,3,5-Trimethylbenzene	5.00	U
95-63-6	1,2,4-Trimethylbenzene	5.00	U
108-05-4	Vinyl acetate	50.0	U
75-01-4	Vinyl chloride	2.00	U
108-38-3	m,p-Xylene	5.00	U
95-47-6	o-Xylene	5.00	U

Case Study - Waste Determination (Cont'd)
Appendix C

FORM 1 VOA

EPA 8260 ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs
Lab Code: 11143
Matrix (soil/water): waste
Sample wt/vol: 10 (g/mL) g
Level: (low/med) LOW
% Moisture: 20
GC Column:

XYZ-03-SS
SDG No.: XY-9533
Lab Sample ID: XY-9533-1
Date Received: 18-Jul-97
Date Analyzed: 25-Jul-97
Dilution Factor: 1
ID: 0.53(mm)

CAS No.	Compound	Concentration Units mg/l	Q
67-64-1	Acetone	20.0	U
107-13-1	Acrylonitrile	105.00	-
71-43-2	Benzene	5.00	U
108-86-1	Bromochloromethane	5.00	U
74-97-5	Bromodichloromethane	5.00	U
75-27-4	Bromoform	5.00	U
75-15-0	Carbon disulfide	5.00	U
56-23-5	Carbon tetrachloride	5.00	U
108-90-7	Chlorobenzene	5.00	U
75-00-3	Chloroform	5.00	U
67-66-3	2-Chlorotoluene	5.00	U
95-49-8	4-Chlorotoluene	5.00	U
106-43-4	Dibromochloromethane	5.00	U
110-75-8	1,2-Dibromo-3-chloropropane	5.00	U
75-34-3	1,2-Dibromomethane	5.00	U
156-59-2	1,2-Dichlorobenzene	5.00	U
540-59-0	1,3-Dichlorobenzene	5.00	U
78-87-5	trans-1,2-Dichloroethene	5.00	U
594-20-7	1,2-Dichloropropane	5.00	U
563-58-6	2,2-Dichloropropane	5.00	U
142-28-9	1,1-Dichloropropene	5.00	U
10061-01-5	cis-1,3-Dichloropropane	5.00	U
10061-02-6	trans-1,2-Dichloropropane	5.00	U
100-41-4	Ethylbenzene	5.00	U
591-78-6	2-Hexanone	5.00	U
74-83-9	Bromomethane	30.00	-
74-87-3	Chloromethane	5.00	U
74-95-3	Dibromomethane	65.00	-
78-93-3	2-Butanone	120.00	
74-88-4	Iodomethane	5.00	U
75-09-2	Methylene chloride	85.00	-
108-10-1	4-Methyl-2-pentanone	100	U
87-61-6	Styrene	5.00	U
630-20-6	1,1,1,2-Tetrachloroethane	5.00	U
79-34-5	1,1,2,2-Tetrachloroethane	5.00	U
127-18-4	Tetrachloroethene	5.00	U
108-10-1	Toluene	5.00	U

Case Study - Waste Determination (Cont'd)
Appendix C

FORM 1 VOA

EPA 8260 ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs	XYZ-03-SS
Lab Code: 11143	SDG No.: XY-9533
Matrix (soil/water): waste	Lab Sample ID: XY-9533-1
Sample wt/vol: 10 (g/mL) g	Date Received: 18-Jul-97
Level: (low/med) LOW	Date Analyzed: 25-Jul-97
% Moisture: 20	Dilution Factor: 1
GC Column:	ID: 0.53(mm)

CAS No.	Compound	Concentration Units mg/l	Q
87-61-6	1,2,3-Trichlorobenzene	5.00	U
120-82-1	1,2,4-Trichlorobenzene	5.00	U
71-55-6	1,1,1-Trichloroethane	5.00	U
79-00-5	1,1,2-Trichloroethane	5.00	U
79-01-6	Trichloroethene	5.00	U
75-69-4	Trichlorofluoromethane	5.00	U
96-18-4	1,2,3-Trichloropropane	5.00	U
108-05-4	1,3,5-Trimethylbenzene	5.00	U
95-63-6	1,2,4-Trimethylbenzene	5.00	U
108-05-4	Vinyl acetate	50.0	U
75-01-4	Vinyl chloride	2.00	U
108-38-3	m,p-Xylene	5.00	U
95-47-6	o-Xylene	5.00	U

Case Study - Waste Determination (Cont'd)
Appendix C

FORM 1 VOA

EPA 8260 ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs	XYZ-04-SS
Lab Code: 11143	SDG No.: XY-9677
Matrix (soil/water): waste	Lab Sample ID: XY-9677-1
Sample wt/vol: 10 (g/mL) g	Date Received: 20-Nov-97
Level: (low/med) LOW	Date Analyzed: 22-Nov-97
% Moisture: 20	Dilution Factor: 1
GC Column:	ID: 0.53(mm)

CAS No.	Compound	Concentration Units mg/l Q
67-64-1	Acetone	20.0 U
107-13-1	Acrylonitrile	105.00
71-43-2	Benzene	5.00 U
108-86-1	Bromochloromethane	5.00 U
74-97-5	Bromodichloromethane	5.00 U
75-27-4	Bromoform	5.00 U
75-15-0	Carbon disulfide	5.00 U
56-23-5	Carbon tetrachloride	5.00 U
108-90-7	Chlorobenzene	5.00 U
75-00-3	Chloroform	5.00 U
67-66-3	2-Chlorotoluene	5.00 U
95-49-8	4-Chlorotoluene	5.00 U
106-43-4	Dibromochloromethane	5.00 U
110-75-8	1,2-Dibromo-3-chloropropane	5.00 U
75-34-3	1,2-Dibromomethane	5.00 U
156-59-2	1,2-Dichlorobenzene	5.00 U
540-59-0	1,3-Dichlorobenzene	5.00 U
78-87-5	trans-1,2-Dichloroethene	5.00 U
594-20-7	1,2-Dichloropropane	5.00 U
563-58-6	2,2-Dichloropropane	5.00 U
142-28-9	1,1-Dichloropropene	5.00 U
10061-01-5	cis-1,3-Dichloropropane	5.00 U
10061-02-6	trans-1,2-Dichloropropane	5.00 U
100-41-4	Ethylbenzene	5.00 U
591-78-6	2-Hexanone	5.00 U
74-83-9	Bromomethane	20.00 -
74-87-3	Chloromethane	5.00 U
74-95-3	Dibromomethane	75.00 -
78-93-3	2-Butanone	125.00
74-88-4	Iodomethane	5.00 U
75-09-2	Methylene chloride	90.00
108-10-1	4-Methyl-2-pentanone	100 U
87-61-6	Styrene	5.00 U
630-20-6	1,1,1,2-Tetrachloroethane	5.00 U
79-34-5	1,1,2,2-Tetrachloroethane	5.00 U
127-18-4	Tetrachloroethene	5.00 U
108-10-1	Toluene	5.00 U

Case Study - Waste Determination (Cont'd)
Appendix C

FORM 1 VOA

EPA 8260 ORGANICS ANALYSIS DATA SHEET

Lab Name: ABC Labs	XYZ-04-SS
Lab Code: 11143	SDG No.: XY-9677
Matrix (soil/water): waste	Lab Sample ID: XY-9677-1
Sample wt/vol: 10 (g/mL) g	Date Received: 20-Nov-97
Level: (low/med) LOW	Date Analyzed: 22-Nov-97
% Moisture: 20	Dilution Factor: 1
GC Column:	ID: 0.53(mm)

CAS No.	Compound	Concentration Units mg/l Q
87-61-6	1,2,3-Trichlorobenzene	5.00 U
120-82-1	1,2,4-Trichlorobenzene	5.00 U
71-55-6	1,1,1-Trichloroethane	5.00 U
79-00-5	1,1,2-Trichloroethane	5.00 U
79-01-6	Trichloroethene	5.00 U
75-69-4	Trichlorofluoromethane	5.00 U
96-18-4	1,2,3-Trichloropropane	5.00 U
108-05-4	1,3,5-Trimethylbenzene	5.00 U
95-63-6	1,2,4-Trimethylbenzene	5.00 U
108-05-4	Vinyl acetate	50.0 U
75-01-4	Vinyl chloride	2.00 U
108-38-3	m,p-Xylene	5.00 U
9-54-76	o=Xylene	5.00 U

Case Study - Waste Determination (Cont'd)
Appendix C
Answers

25D DATA:

Check the data sheets to insure that all samples were collected and analyzed within a one year time period.

The four samples were collected and analyzed within one calendar year.

Check the data to insure that the proper number of samples were collected to correct high fluctuations in the data due to seasonal variability.

The four samples were sufficient since the results are very similar. There were no seasonal fluctuations.

Calculate the volatile organic concentration of this waste stream

$$\mathbf{C_{ave} = (1/Q_T) * \quad (Q_j * C_j)}$$

Q_T = discrete mass quantity$_1$ + discrete mass quantity$_2$ + discrete mass quantity$_3$ + discrete mass quantity$_4$

$$Q_T = 750 \text{ kg/hr} + 725 \text{ kg/hr} + 640 \text{ kg/hr} + 715 \text{ kg/hr} = 2830 \text{ kg/hr}$$

$$C_{ave} = (1/2830) * \{[(750)*(298+158)] + [(725)*(253+158)] + [(640)*(310*168)] + [(715)*(285+155)]\} = 445.40 \text{ ppmw}$$

Therefore, no Subpart CC controls are required.

8260 DATA

Check the data sheets to insure that all samples were collected and analyzed within a one year time period.

The four samples were collected and analyzed within one calendar year.

Check the data to insure that the proper number of samples were collected to correct high fluctuations in the data due to seasonal variability.

The four samples were sufficient since the results are very similar. There were no seasonal fluctuations

Case Study - Waste Determination (Cont'd)
Appendix C
Answers

8260 DATA

Locate the fraction measure f_m correction values for all constituents with results above the reporting limits

From Table 34, in 40 CFR 63, Subpart G, Appendix:

Constituent	f_m value
Acrylonitrile	1.00
Bromomethane	1.00
Dibromomethane	1.00
2-Butanone	0.99
Methylene Chloride	1.00

Sum all the detected values with the f_m correction

XYZ-01-SS: (115+20+75+133.65+90) = 433.65
XYZ-02-SS: (110+25+ 60+94.05+105) = 394.05
XYZ-03-SS: (105+30+65+118.8+85) = 403.8
XYZ-04-SS: (105+20+75+123.75+90) = 413.75

Sum all the nondetected values for each sample

XYZ-01-SS: 355 ppm
XYZ-02-SS: 355 ppm
XYZ-03-SS: 355 ppm
XYZ-04-SS: 355 ppm

divide the sum by 2 ---> 177.5 and add this value into the sum for the C_j calculation

XYZ-01-SS: 433.65 + 177.5 = 611.15
XYZ-02-SS: 394.05 + 177.5 = 571.55
XYZ-03-SS: 403.8 + 177.5 = 581.3
XYZ-04-SS: 413.75 + 177.5 = 591.25

$$Q_T = (750\ kg/hr + 725\ kg/hr + 640\ kg/hr + 715\ kg/hr) = 2830\ kg/hr$$

$$\mathbf{C_{ave} = (1/Q_T) * \ (Q_j * C_j)}$$

$$C_{ave} = (1/2830) * [(750)(611.15)+(725)(571.55)+(640)(581.3)+(715)(591.25)] = 590\ ppmw$$

Therefore, CC controls are required.

Case Study - Treatment Options and Standards
RCRA Air Emissions Standards for Tanks, Surface Impoundments, and Containers
Appendix C

Under the provisions of the Subpart CC rules [40 CFR 265.1083(c)(2)], air emission controls are no longer required for waste management units that receive hazardous waste when the organic content of the waste has been reduced by a treatment process that meets conditions specified in the rules. The following four (4) examples illustrate the determination of acceptable waste treatment through examination of the various alternatives provided in the rules. These examples include calculation of the exit concentration limit ($\mathbf{C_T}$), the organic reduction efficiency (**R**), the mass removal rate (**MR**), the required mass removal rate (**RMR**), the organic mass biodegradation rate ($\mathbf{MR_{bio}}$), and the organic biodegradation efficiency ($\mathbf{R_{bio}}$); the combustion process alternatives are not covered in the examples.

In completing the case study, the participants will follow the same basic strategy for evaluating the performance of each of the example treatment schemes. The basic steps provided in all four of the examples are:

- Characterize the waste streams at point of waste origination
- Determine a volatile organic (VO) concentration (Method 25D equivalent concentration) for the waste at point of waste origination or at point of waste treatment (entering and exiting the treatment system)
- Calculate $\mathbf{C_T}$, **R**, **MR**, **RMR**, $\mathbf{MR_{bio}}$, $\mathbf{R_{bio}}$, as needed for the particular treatment alternative
- Evaluate the performance of the treatment system; determine if performance criteria are met

Example Treatment Scenarios

General Conditions Applicable to All Four Examples.
Four (4) hazardous waste streams are generated by a manufacturing process; the wastes are collected in closed individual drain systems and sent to a common storage tank where the waste streams mix. Both the collection system and the storage tank system comply with the relevant control requirements of the Subpart CC rules. The aggregated hazardous waste stream is hard piped to the treatment unit. In order to simplify the calculations and presentation of the material in the examples, the determinations that are formatted in terms of mass (e.g. kg/hr) within the regulation are presented in the examples in units of concentration, ppmw. This assumes that the flow rates into and out of the treatment systems and the density of the waste before and after treatment are unchanged.

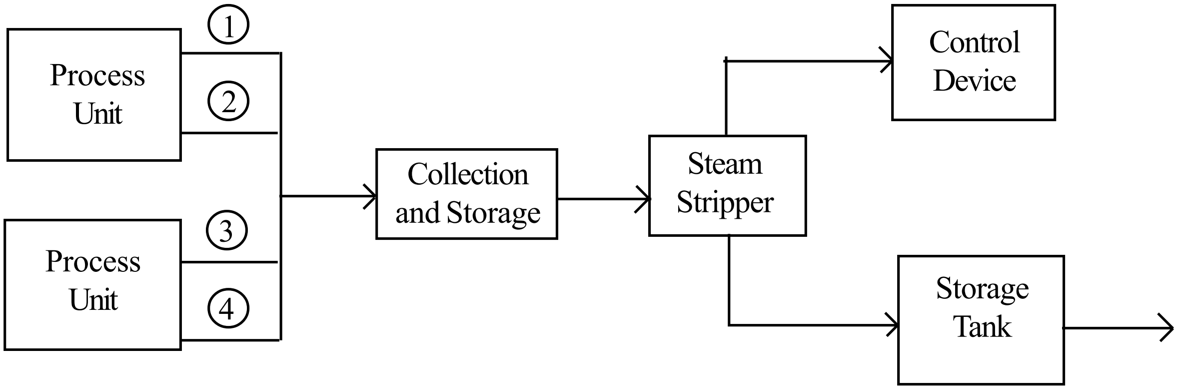
Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Conditions Specific to Individual Examples.

1. Steam Stripping. The aggregated hazardous waste stream is hard piped to a steam stripper. The steam stripper condenser vent is controlled to meet the requirements of Subpart AA provisions for control devices and closed vent systems. The steam stripper effluent is sent to a storage tank.
2. Biological Treatment. The aggregated hazardous waste stream is hard piped to a biological treatment unit where the waste is treated in the uncontrolled bio-unit. The bio-unit is considered a surface impoundment for the RCRA permit. Following bio-treatment the waste is piped to a secondary clarifier then to a chlorine basin from which it is discharged. The on-site wastewater treatment system has a National Pollution Discharge Elimination System (NPDES) permit.
3. Air Stripping followed by Biological Treatment. The aggregated hazardous waste stream is hard piped to an air stripping unit. The exit gas stream from the air stripper is controlled by a combustion unit that meets the control requirements of Subpart CC. The effluent from the air stripping unit is hard piped to a biodegradation unit; the bio-unit is uncontrolled, i.e., open to the atmosphere. The bio-unit is considered a surface impoundment for the RCRA permit.
4. Steam Stripping followed by Biological Treatment. The aggregated hazardous waste stream is hard piped to a steam stripper. The steam stripper condenser vent is controlled to meet the requirements of Subpart AA provisions for control devices and closed vent systems. The steam stripper effluent is sent to a biological treatment unit; the bio-unit is uncontrolled, i.e., open to the atmosphere. The bio-unit is considered a surface impoundment for the RCRA permit.

Example 1: Steam Stripping

Flow Diagram.



Situation.

Four (4) hazardous waste streams are generated by a manufacturing process; the wastes are collected in closed individual drain systems and sent to a common storage tank where the waste streams mix. Both the collection system and the storage tank system comply with the relevant control requirements of the Subpart CC rules. The aggregated hazardous waste stream is hard piped to a steam stripper (Point A). The steam

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

stripper condenser vent is controlled to meet the requirements of Subpart AA provisions for control devices and closed vent systems. The steam stripper effluent is sent to a storage tank (Point B). Assume that the steam stripper inlet flow (Point A) and the outlet flow (Point B) are the same (70 liters per second) and the density of the waste stream does not change as a result of treatment.

The owner/operator has decided to use the treatment process alternative that involves the determination of the organic reduction efficiency (**R**) in §265.1083(c)(2)(ii). Use of this alternative limits the number and location of the waste VO concentrations that must be made to determine if the treatment system meets the criteria in the rule. For example, since the calculation of **R** is based on the actual VO mass (concentration, ppmw, can be used in this example because flow and density do not change) of the waste entering and exiting the treatment process (at Points A and B) no data on VO concentrations are needed for the four individual wastes at their point of waste origination (Points 1 through 4). Under this treatment alternative, if the organic reduction efficiency (**R**) is greater than or equal to 95% and the VO concentration of the treated waste is less than 100 ppmw, then downstream units managing this waste stream no longer require control for air emissions under Subpart CC.

The owner/operator has used direct measurement (using OW Methods 624 and 625) to determine the actual organic concentrations for the three organic constituents present in the aggregated waste stream (i.e., cresol, methanol, and chloroform) entering and exiting the steam stripper. The average constituent concentrations at Point A and Point B are presented below. The owner/operator does not have any waste constituent data at the point of waste origination for the waste streams that comprise the aggregated waste at Point A. In addition, the owner/operator does not wish to conduct a Method 25D analysis for the waste at Point A and Point B; however, the VO concentration of the waste is needed at these two locations in order to determine the total waste volatile organic mass flow entering and exiting the process. Therefore, the owner/operator makes use of the EPA published values of the fraction measured by Method 25D ($\mathbf{f_m}$) that have been determined by EPA for a large range of chemical constituents to estimate the VO concentration as measured by Method 25D. A list of $\mathbf{f_m}$ values are in EPA Docket No. F-95-CE3A-FFFFF. To calculate the Method 25D VO concentration for a particular constituent, the actual concentration is multiplied by the $\mathbf{f_m}$ value to obtain an estimate of what concentration would be seen by Method 25D.

Measurements and Calculations.

Step 1. Identify the actual composition of the waste streams and waste stream flow rates. If EPA Method 25D is to be run on the waste streams, skip this step.

Waste Compositions:

	Waste Constituents, ppmw			
	cresol	methanol	chloroform	Total
Actual Concentrations (measured at Point A)	227	386	537	1,150
Actual Concentrations (measured at Point B)	115	40	10	165

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Step 2. Measure the Method 25D VO concentrations, or estimate the VO concentrations from the wastewater analysis. Obtain the $\mathbf{f_m}$ value for each compound. Multiply each concentration by the $\mathbf{f_m}$ value to obtain the estimated Method 25D VO concentration.

VO Concentration Determination:

	Waste Constituents, ppmw			
	cresol	methanol	chloroform	Total
f_m fraction measured by EPA Method 25D	0.0345	0.433	1.03	
VO(25D) Concentrations (estimated at Point A)	8	167	553	728
VO(25D) Concentration (estimated at Point B)	4	17	11	32

Step 3. Calculate the organic reduction efficiency (**R**) for the treatment unit. **R** is calculated by subtracting the organic mass exiting the treatment unit from the organic mass entering the treatment unit and the dividing the remainder by the organic mass entering the treatment unit and multiplying by a hundred to get a percent.

Organic Reduction Efficiency:

	Waste Constituents, ppmw			
	cresol	methanol	chloroform	Total
VO(25D) Concentrations (estimated at Point A)	8	167	553	728
VO(25D) Concentration (estimated at Point B)	4	17	11	32
VO mass removal (ppmw) (Calculated: A - B)	4	150	542	696
Organic Reduction Efficiency, R(%) (Calculated: [A-B]/A)	50%	90%	98%	96%

Questions.

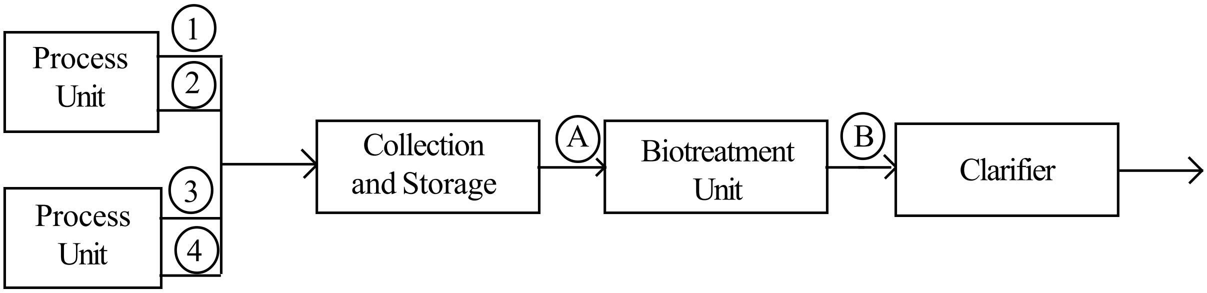
Do the waste management units following the steam stripper require control under the Subpart CC rules?

Why?

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Example 2: Biological Treatment

Flow Diagram.



Situation.

Four (4) hazardous waste streams are generated by a manufacturing process; the wastes are collected in closed individual drain systems and sent to a common storage tank where the waste streams mix. Both the collection systems and the storage tank system comply with the relevant control requirements of the Subpart CC rules. The aggregated hazardous waste stream is hard piped to a biological treatment unit where the waste is treated in the uncontrolled bio-unit. The bio-unit is considered a surface impoundment for the RCRA permit. Following bio-treatment the waste is piped to a secondary clarifier then to a chlorine basin from which it is discharged. The on-site wastewater treatment system has a National Pollution Discharge Elimination System (NPDES) permit.

The owner/operator has decided to use the treatment process alternative that involves the determination of the organic mass biodegradation rate **(MR_{bio})** and the required mass removal rate **(RMR)** in §265.1083(c)(2)(iv). Use of this alternative is not waste stream specific in that it does not require a 95% reduction for every waste stream; the required mass removal is based on the aggregated organic mass of the untreated waste. This alternative however does require VO concentration data at the point of waste origination (Points 1 through 4) for the four individual wastes that comprise the aggregate waste stream. Under this treatment alternative, if the actual organic mass biodegradation rate **(MR_{bio})** is equal to or greater than the required mass removal rate **(RMR)**, then downstream units managing this waste stream no longer require control for air emissions under Subpart CC. In addition, bio-units that meet this condition are exempt from the control requirements of the Subpart CC rules; no cover is required for the surface impoundment (i.e., the bio-unit).

The owner/operator has used direct measurement (using methods in SW 846 for volatiles and semi-volatiles) to determine the actual organic concentrations at their point of waste origination for the three organic constituents present in each of the four waste streams (i.e., cresol, methanol, and chloroform) that make up the aggregated waste. The constituent concentrations at Points 1 through 4 are presented below. The owner/operator does not wish to conduct a Method 25D analysis for the wastes streams at their point of waste origination; however, the VO concentration of the waste is needed at these four locations in order to determine the required mass removal rate **(RMR)**. Therefore, the owner/operator makes use of the EPA published values of the fraction measured by Method 25D (**f_m**) that have been determined by EPA for a large range of chemical constituents to estimate the VO concentration as measured by Method 25D. To calculate the Method 25D VO concentration for a particular constituent, the actual concentration is multiplied by the **f_m** value to obtain an estimate of what concentration would be seen by Method 25D.

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Measurements and Calculations.

Step 1. Identify the actual composition of the waste streams and waste stream flow rates. If EPA Method 25D is to be run on the waste streams, skip this step.

Waste Compositions:

	Waste Constituents, ppmw				
	cresol	methanol	chloroform	Total	Flow (Q, L/s)
Actual Concentration					
(measured at Point 1)	700	600	387	1,687	10
(measured at Point 2)	300	800	600	1,700	20
(measured at Point 3)	34	12	2	48	250
(measured at Point 4)	0	25	0	25	400

Step 2. Measure the Method 25D VO concentrations, or estimate the VO concentrations from the wastewater analysis. Obtain the $\mathbf{f_m}$ value for each compound. Multiply each concentration by the $\mathbf{f_m}$ value to obtain the estimated Method 25D VO concentration.

VO Concentration Determination:

	Waste Constituents, ppmw				
	cresol	methanol	chloroform	Total	Flow (Q, L/s)
$\mathbf{f_m}$, fraction measured by EPA method 25D					
0.0345					
0.433					
1.03					
VO Concentration (25D)					
(estimated at Point 1)	24	260	399	683	10
(estimated at Point 2)	10	346	618	975	20
(estimated at Point 3)	1	5	2	8	250
(estimated at Point 4)	0	11	0	11	400

Step 3. Estimate the required organic mass removal rate **(RMR)**. The treatment unit's actual organic mass biodegraded **($\mathbf{MR_{bio}}$)** must equal or exceed the **RMR** or the bio-unit must be controlled for air emissions and the waste management units following the bio-unit must be controlled for air emissions. The VO concentration that exceeds the action level of 500 ppmw (C_{AL}) is used as the basis for the **RMR** calculation (if $\mathbf{C_{VO}} > 500$ ppmw, then $C_{AL} = \mathbf{C_{VO}} - 500$; if $\mathbf{C_{VO}} < 500$ ppmw, then $C_{AL} = 0$). Within the regulation the **RMR** has units of kg/hr; however, for this example it is assumed that the densities of the hazardous waste streams are equal to that of water. Therefore, for ease of comparison, the **RMR** is expressed in terms of ppmw.

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Required Mass Removal Rate Calculation:

Waste Stream	Q (L/s)	C_{vo} (ppmw)	$Q * C_{vo}$ (ppmw)	C_{AL}	$Q * C_{AL}$
Point 1	10	683	6,830	183	1,830
Point 2	20	975	19,500	475	9,500
Point 3	250	8	2,000	0	0
Point 4	400	11	4,400	0	0
Sums	680		32,730		11,330

VO Concentration at Point A = (32,730 ÷ 680) = 48 ppmw
RMR = (11,330 ÷ 680) = 17 ppmw

Step 4. The actual waste constituent concentrations and the VO concentrations are calculated on a flow-weighted mass basis for the aggregated waste stream at Point A, the inlet to the biotreatment unit. The results of these calculations are presented below.

Flow-Weighted Average Concentration:

Point A	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
Actual Concentration	32	34	30	81
f_m, fraction measured by EPA Method 25D	0.0345	0.433	1.03	
VO (25D) Concentration	1	15	31	47

Step 5. The biological removal effectiveness for the bio-treatment unit, the organic mass biodegradation rate (**MR_{bio}**) is calculated using the VO concentration at the inlet to the treatment unit, Point A, and the organic fraction biodegraded (**f_{bio}**). **f_{bio}** is obtained using the methodology in 40 CFR Part 63, Appendix C, "Determination of the Fraction Biodegraded (**f_{bio}**) in a Biological Treatment Unit." **MR_{bio}** equals the organic mass entering the bio-unit multiplied by **f_{bio}**. The fraction of organics that are lost to the air for the bio-unit, f_e, can also be obtained from Appendix C and EPA's WATER8 air emission model; these values can then be used to estimate air emissions for the bio-unit. The **MR_{bio}** is formatted in units of kg/hr in the regulation; however, as previously noted this mass value is expressed in terms of ppmw in this example.

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Organic Mass Biodegraded Calculation:

Point A	Waste Constituent Flow-Weighted Average Concentration ppmw			
	cresol	methanol	chloroform	Total
VO (25D) Concentration (Mass in)	1	15	31	47
$\mathbf{f}_{bio}$, fraction biodegraded	0.999	0.95	0.18	
f_e fraction emitted to air	0.0001	0.04	0.8	
$\mathbf{MR}_{bio}$, mass biodegraded ($\mathbf{f}_{bio}$ x Mass in)	1	14	6	21
Air emissions from bio-unit (f_e, x Mass In)	0	1	25	26
Biological removal fraction ($\mathbf{f}_{bio}$) (Overall mass weighted)				0.45
R_{bio} (mass weighted)				45%
Air emissions fraction				0.55

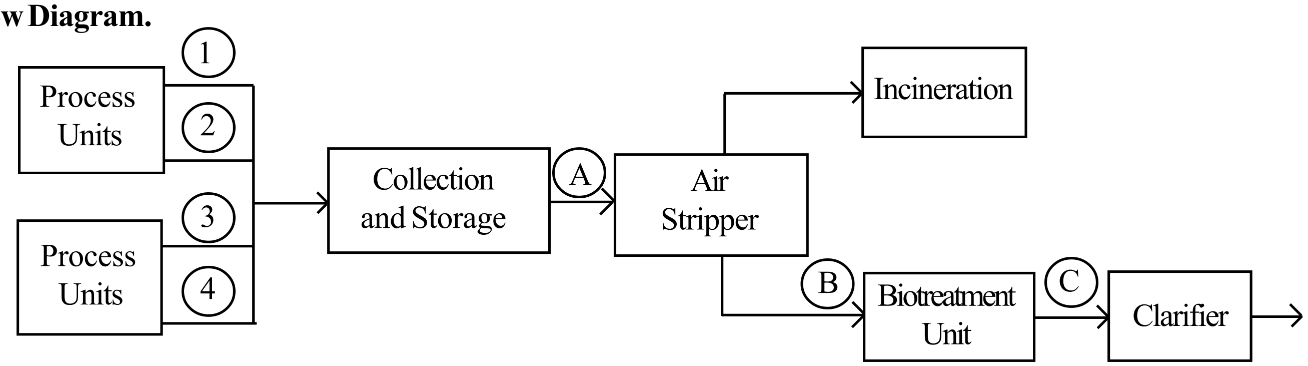
Questions.

Does the bio-treatment unit need to be controlled?

Why?

Example 3: Air Stripping Followed by Biological Treatment

Flow Diagram.



Situation.

Four (4) hazardous waste streams are generated by a manufacturing process; the wastes are collected in closed individual drain systems and sent to a common storage tank where the waste streams mix. Both the collection systems and the storage tank system comply with the relevant control requirements of the Subpart CC rules. The aggregated hazardous waste stream is hard piped to an air stripping unit. The exit gas stream from the air stripper is controlled by a combustion unit that meets the control requirements of Subpart CC. The effluent from the air stripping unit is hard piped to a biodegradation unit; the bio-unit is uncontrolled, i.e., open to the atmosphere. The bio-unit is considered a surface impoundment for the RCRA permit. Following bio-treatment,

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

the waste is piped to a secondary clarifier then to a chlorine basin from which it is recycled to the plant as process water. The on-site wastewater treatment system does not have a National Pollution Discharge Elimination System (NPDES) permit.

The owner/operator has decided to use the treatment process alternative that involves the determination of the exit concentration limit (**C_T**) in §265.1083(c)(2)(l). Use of this alternative accommodates mixing of waste streams and accounts for dilution of regulated waste with dilute non-regulated waste streams; this alternative, although waste stream specific, does not require a 95% reduction for every waste system. This alternative, in order to calculate **C_T**, requires VO concentration data at the point of waste origination (Points 1 through 4) for the four individual wastes that comprise the aggregated waste stream. Under this treatment alternative, if the VO concentration of the treated waste is less than the calculated exit concentration limit (**C_T**), then downstream units managing this waste stream no longer require control for air emissions under Subpart CC.

The owner/operator has used direct measurement (using methods in SW-846 for volatiles and semi-volatiles) to determine the actual organic concentrations at their point of waste origination for the three organic constituents present in each of the four waste streams (i.e., cresol, methanol, and chloroform) that make up the aggregated waste. The constituent concentrations at Points 1 through 4 are presented below. The owner/operator does not wish to conduct a Method 25D analysis for the wastes streams at their point of waste origination; however, the VO concentration of the waste is needed at these four locations in order to determine the exit concentration limit (**C_T**). Therefore, the owner/operator makes use of the EPA published values of the fraction measured by Method 25D (**f_m**) that have been determined by EPA for a large range of chemical concentration for a particular constituent, the actual concentration is multiplied by the **f_m** value to obtain an estimate of what concentration would be seen by Method 25D.

Measurements and Calculations.

Step 1. Identify the actual composition of the waste streams and waste stream flow rates. If EPA Method 25D is to be run on the waste streams, skip this step.

Waste Compositions:

	Waste Constituents, ppmw				
	cresol	methanol	chloroform	Total	Flow (Q, L/s)
Actual Concentration					
(measured at Point 1)	700	400	2,500	3,600	10
(measured at Point 2)	300	200	43	543	20
(measured at Point 3)	800	50	2	852	30
(measured at Point 4)	80	124	7	211	8

Step 2. Measure the Method 25D VO concentrations, or estimate the VO concentrations from the wastewater analysis. Obtain the **f_m** value for each compoud. Multiply each concentration by the **f_m** value to obtain the estimated Method 25D VO concentration.

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

VO Concentration Determination:

	Waste Constituents, ppmw				
	cresol	methanol	chloroform	Total	Flow (Q, L/s)
$\mathbf{f_m}$, fraction measured by EPA Method 25D	0.0345	0.433	1.03		
VO Concentration (25D)					
(estimated at Point 1)	24	173	2,575	2,772	10
(estimated at Point 2)	10	87	44	141	20
(estimated at Point 3)	28	22	2	51	30
(estimated at Point 4)	3	54	7	64	8

Step 3. Calculate the exit concentration limit ($\mathbf{C_T}$). The treatment unit's exit stream VO concentration must be less than the $\mathbf{C_T}$ or the waste management units following the treatment unit/system must be controlled for air emissions. The VO concentration of the original four waste streams (Points 1 through 4) that is less than the action level of 500 ppmw (C_{EX}) is used as the basis for the $\mathbf{C_T}$ calculation. (If $\mathbf{C_{VO}} > 500$ ppmw, then $C_{EX} = 500$; if $\mathbf{C_{VO}} < 500$ ppmw, then $C_{EX} = \mathbf{C_{VO}}$.)

Exit concentration Limit Calculation:

Waste Stream	Q (L/s)	C_{vo} (ppmw)	$Q*C_{vo}$ (ppmw)	C_{EX}	$Q*C_{EX}$
Point 1	10	2,772	27,720	500	5,000
Point 2	20	141	2,820	141	2,820
Point 3	30	51	1,530	51	1,530
Point 4	8	64	512	64	512
Sums	68		32,582		9,862

VO Concentration at Point A = (32,582 ÷ 68) = 479 ppmw
$\mathbf{C_T}$ = (9,862 ÷ 68) = 145 ppmw

Step 4. The actual waste constituent concentrations and the VO concentrations are calculated on a flow-weighted mass basis for the aggregated waste stream at Point A, the inlet to the air stripper unit. The results of these calculations are presented below.

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Flow-Weighted Average Concentration:

Point A	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
Actual Concentration	553	154	382	1089
f_m, fraction measured by EPA Method 25D	0.0345	0.433	1.03	
VO (25D) Concentration	19	67	393	479

Step 5. The actual waste constituent concentrations and the VO concentrations are measured/calculated on a flow-weighted mass basis for the aggregated waste stream at Point B, the outlet of the air stripper unit (and inlet to the bio-unit). The results of these calculations are presented below. Note that the VO concentrations are too low to be measured by Method 25D. Other methods were used to obtain individual constituent concentrations and the results were multiplied by the f_m factor for each compound.

Flow-Weighted Average Concentration:

Point B	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
Actual concentration	435	76	87	598
VO (25D) Concentration	15	33	89	137
VO mass removed by air stripper (calculated: A - B)	4	34	304	342
VO fraction removed in air stripper (Calculated: [A - B]/A)	0.21	0.51	0.77	0.71

Step 6. The actual waste constituent concentrations and the VO concentrations are measured/calculated on a flow-weighted mass basis for the aggregated waste stream at Point C, the outlet of the bio-unit. The results of these calculations are presented below. Note that the VO concentrations are too low to be measured by Method 25D. Other methods were used to obtain individual constituent concentrations and the results were multiplied by the f_m factor for each compound.

Flow-Weighted Average Concentration:

Point C	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
Actual Concentration	0.30	0.80	0.07	1.2
f_m, fraction measured by EPA Method 25D	.0345	0.433	1.03	
VO (25D) Concentration	0.01	0.35	0.07	0.43

Step 7. The biological removal effectiveness for the bio-treatment unit [the organic biodegradation efficiency (**R_{bio}**) and the organic mass biodegradation rate (**MR_{bio}**)] are calculated using the VO concentration at the inlet

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

to the biotreatment unit, Point B, and the organic fraction biodegraded ($\mathbf{f_{bio}}$). $\mathbf{f_{bio}}$ is obtained using the methodology in 40 CFR Part 63, Appendix C, "Determination of the Fraction Biodegraded ($\mathbf{f_{bio}}$) in a Biological Treatment Unit." $\mathbf{R_{bio}}$ is equal to $\mathbf{f_{bio}}$ multiplied by 100. $\mathbf{MR_{bio}}$ equals the organic mass entering the bio-unit multiplied by $\mathbf{f_{bio}}$. The fraction of organics that are lost to the air from the bio-unit, f_e, can also be obtained from Appendix C and the EPA's WATER8 air emission model; these values can then be used to estimate air emissions for the bio-unit.

The $\mathbf{MR_{bio}}$ is formatted in units of kg/hr in the regulation; however, as previously noted, this mass value is expressed in terms of ppmw in this example. The organic reduction efficiency (**R**) for the bio-unit is calculated on a mass in and mass out basis. This value however does not reflect the actual control efficiency or performance of the unit because air emissions from the bio-unit are not taken into consideration in the calculation that uses only the VO mass of the waste entering and exiting the treatment unit.

Organic Mass Biodegraded Calculation:

	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
VO (25D) Concentration (Point B, Mass in)	15	33	89	137
$\mathbf{f_{bio}}$, fraction biodegraded	0.999	0.95	0.18	
f_e, fraction emitted to air	0.0001	0.04	0.8	
$\mathbf{MR_{bio}}$, mass biodegraded ($\mathbf{f_{bio}}$ x Mass in)	15	31	16	62
Air emissions from bio-unit (f_e, x Mass In)	0	1	72	73
Biological removal fraction ($\mathbf{f_{bio}}$) (Overall mass weighted)				0.45
R_{bio} (mass weighted)				45%
Air emissions fraction				0.53
VO (25D) Concentration (Point C)	0.01	0.35	0.07	0.43
Organic reduction Efficiency (R) [Mass in - Mass out) / Mass in]	99%	99%	98%	99%

Step 8. The overall treatment effectiveness, i.e., organic reduction efficiency, for the two unit system is calculated using the total VO mass into the two unit system (i.e., air stripper and bio-unit) and the mass removed by the air stripper plus the amount biodegraded in the bio-unit. Mass removed through air emissions from the air stripper and the bio-unit are not considered in the overall reduction efficiency.

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Treatment System Reduction Efficiency:

	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
Total VO mass in (Point A), ppmw	19	67	393	479
Total VO mass removed, ppmw	19	65	320	404
Organic Reduction efficiency (%)	99^{+}%	98%	81%	84%

Questions.

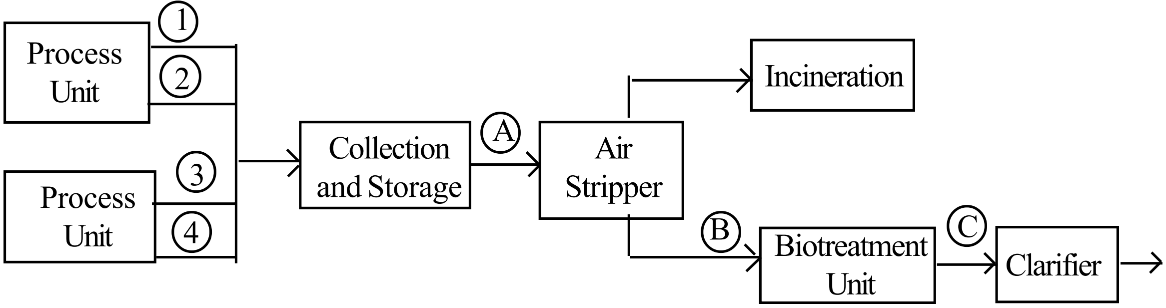
Do the waste management units following the biotreatment unit need to be controlled?

Does the bio-unit meet the requirements for organic reduction efficiency?

Does the biotreatment unit need to be controlled under Subpart CC requirements? Why?

Example 4: Steam Stripping Followed by Biological Treatment

Flow Diagram.



Situation.

Four (4) hazardous waste streams are generated by a manufacturing process; the wastes are collected in closed individual drain systems and sent to a common storage tank where the waste streams mix. Both the collection systems and the storage tank system comply with the relevant control requirements of the Subpart CC rules. The aggregated hazardous waste stream is hard piped to a steam stripper. The steam stripper condenser vent is controlled to meet the requirements of Subpart AA provisions for control devices and closed vent systems. The steam stripper effluent is sent to a biological treatment unit; the bio-unit is uncontrolled, i.e., open to the atmosphere. The bio-unit is considered a surface impoundment for the RCRA permit. Following bio-treatment the waste is piped to a secondary clarifier then to a chlorine basin from which it is discharged. The on-site wastewater treatment system has a National Pollution Discharge Elimination System (NPDES) permit.

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

The owner/operator is uncertain if the facility's hazardous waste treatment system meets any of the available treatment alternatives and therefore would like to examine the alternatives to determine if and at what point in the treatment scheme the facility treatment of the waste meets any of the criteria in §265.1083(c)(2).

The owner/operator has used direct measurement using EPA Method 25D to determine the volatile organic (VO) concentrations at their point of waste origination for each of the four waste streams that make up the aggregated waste. The VO concentrations at Points 1 through 4 are presented below. The VO concentration of the wastes is needed at these four locations in order to determine the exit concentration limit (**C_T**) and the required mass removal rate (**RMR**).

Measurements and Calculations.

Step 1. Identify the actual composition of the waste streams and waste stream flow rates. If EPA Method 25D is to be run on the waste streams, skip this step.

Waste Compositions:

Actual waste compositions (i.e., constituent concentrations) were not determined for the four waste streams at the point of waste origination; the owner operator used direct measurement with Method 25D to determine the VO concentrations of the waste streams.

Step 2. Measure the Method 25D VO concentrations, or estimate the VO concentrations from the wastewater analysis.

VO Concentration Determination:

VO Concentration (Measured using EPA Method 25D)	Total VO (ppmw)	Flow (Q, L/s)
Point 1	3,898	10
Point 2	3,994	20
Point 3	1,175	30
Point 4	103	8

Step 3. Calculate the exit concentration limit (**C_T**). A treatment unit's exit stream VO concentration must be less than **C_T**, at the point waste treatment, in order for the waste management units following the treatment unit/system to be exempt from the air emission control requirements. The VO concentration of the original four waste streams (Points 1 through 4) that is less than the action level of 500 ppmw is used as the basis for the **C_T** calculation. Using the procedure outlined in Step 3 of Example 3, the exit concentration limit is calculated.

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Exit Concentration Limit:

$\mathbf{C_T}$ = 453 ppmw

Step 4. Calculate the required organic mass removal rate (**RMR**). The treatment unit's actual organic mass removal rate (**MR**) must exceed the **RMR** or the waste management units following the treatment unit must be controlled for air emissions. The VO concentration that exceeds the action level of 500 ppmw ($C_{AL} = \mathbf{C_{VO}}$ - 500) is used as the basis for the **RMR** calculation. Within the regulation, the **RMR** has units of kg/hr; however, for this example it is assumed that the densities of the hazardous waste streams are equal to that of water. Therefore, for ease of comparison, the **RMR** is expressed in terms of ppmw.

Required Mass Removal Rate Calculation:

Waste Stream	Q (L/s)	C_{vo} (ppmw)	$Q * C_{vo}$	C_{AL} (ppmw)	$Q * C_{AL}$
Point 1	10	3,898	38,980	3398	33,980
Point 2	20	3,994	79,880	3494	69,880
Point 3	30	1,175	35,250	675	20,250
Point 4	8	103	824	0	0
Sums	68		154,934		124,110

VO Concentration, flow weighted average, at Point A = (154,934 ÷ 68) = 2,279 ppmw
RMR = (124,110 ÷ 68) = 1,825 ppmw

Step 5. The actual waste constituent concentrations and the VO concentrations are measured/calculated on a flow-weighted mass basis for the aggregate waste stream at Point B, the outlet of the steam stripper unit (and inlet to the bio-unit). The results of these calculations are presented below. Note that the VO concentrations are too low to be measured by Method 25D. Other methods were used to obtain individual constituent concentrations and the results were multiplied by the $\mathbf{f_m}$ factor for each compound.

Flow-Weighted Average Concentration:

Point B	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
Actual Concentration (measured)	320	792	173	1,285
$\mathbf{f_m}$, fraction measured by EPA Method 25D	0.0345	0.433	1.03	
VO (25D) Concentration (estimated)	11	343	179	533
VO mass removed by stripper (Calculated: A-B)				1,746
VO fraction removed in stripper (Calculated: [A-B]/A)			0.77	
Organic reduction efficiency (**R**) of the steam stripper	=			77%
Exit concentration, $\mathbf{C_{VO}}$, for the steam stripper	=			533

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Step 6. The actual waste constituent concentrations and the VO concentrations are measured/calculated on a flow-weighted mass basis for the aggregate waste stream at Point C, the outlet of the bio-unit. The results of these calculations are presented below. Note that the VO concentrations are too low to be measured by Method 25D. Other methods were used to obtain individual constituent concentrations and the results were multiplied by the $\mathbf{f_m}$ factor for each compound.

Flow-Weighted Average Concentration:

Point C	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
Actual Concentration (measured)	0.30	6.93	3.40	10.63
$\mathbf{f_m}$, fraction measured by EPA Method 25D	0.0345	0.433	1.03	
VO (25D) Concentration (estimated)	0.01	3.00	3.50	6.51

Step 7. The biological removal effectiveness for the bio-treatment unit [the organic biodegradation efficiency ($\mathbf{R_{bio}}$) and the organic mass biodegradation rate ($\mathbf{MR_{bio}}$)] are calculated using the VO concentration at the inlet to the biotreatment unit, Point B, and the organic fraction biodegraded ($\mathbf{f_{bio}}$). $\mathbf{f_{bio}}$ is obtained using the methodology in 40 CFR Part 63, Appendix C, "Determination of the Fraction Biodegraded ($\mathbf{f_{bio}}$) in a Biological Treatment Unit." $\mathbf{R_{bio}}$ is equal to $\mathbf{f_{bio}}$ multiplied by 100. $\mathbf{MR_{bio}}$ equals the organic mass entering the bio-unit multiplied by $\mathbf{f_{bio}}$. The fraction of organics that are lost to the air from the bio-unit, f_e, can also be obtained from Appendix C and the EPA's WATER8 air emission model; these values can then be used to estimate air emissions for the bio-unit. The $\mathbf{MR_{bio}}$ is formatted in units of kg/hr in the regulation; however, as previously noted, this mass value is expressed in terms of ppmw in this example. The organic reduction efficiency (**R**) for the bio-unit is calculated on a mass in and mass out basis. This value however does not reflect the actual control efficiency or performance of the unit because air emissions from the bio-unit are taken into consideration in the calculation that uses only the VO mass of the waste entering and exiting the treatment unit.

Organic Mass Biodegraded Calculation:

	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
VO (25D) Concentration (Point B, Mass in)	11	343	179	533
$\mathbf{f_{bio}}$, fraction biodegraded	0.999	0.95	0.18	
f_e, fraction emitted to air	0.0001	0.04	0.8	
$\mathbf{MR_{bio}}$, mass biodegraded ($\mathbf{f_{bio}}$ x Mass in)	11	326	32	369
Air emissions from bio-unit	0	14	143	157
Biological removal fraction ($\mathbf{f_{bio}}$) (Overall mass weighted)				0.69
R_{bio} (mass weighted)				69%
Air emissions fraction				0.29
VO (25D) Concentration (Point C)	0.01	3.00	3.50	6.51
Organic reduction Efficiency (R) [Mass in - Mass out) / Mass in]	99^{+}%	99%	98%	99%

Case Study - Treatment Options and Standards (Cont'd)
Appendix C

Step 8. The overall treatment effectiveness, i.e., organic reduction efficiency, for the two unit system is calculated using the total VO mass into the two unit system (i.e., steam stripper and bio-unit) and the mass removed by the steam stripper plus the amount biodegraded in the bio-unit. Mass removed through air emissions from the steam stripper and the bio-unit are not considered in the overall reduction efficiency.

Treatment System Reduction Efficiency:

	Waste Constituent Flow-Weighted Average Concentration, ppmw			
	cresol	methanol	chloroform	Total
Total VO mass in (Point A)	19	425	1834	2278
Total VO mass removal rate (MR)	19	408	1688	2115
Organic Reduction efficiency (%)	100	96	92	93

Questions.

Do the waste management units following the biotreatment unit need to be controlled?

Does the bio-unit meet the requirements for organic reduction efficiency?

Does the biotreatment unit need to be controlled under Subpart CC requirements? Why?

Does the two-unit treatment system (i.e., steam stripper and bio-unit) meet the requirements for organic reduction efficiency?

Does the two-unit treatment system (i.e., steam stripper and bio-unit) meet the requirements for organic mass removal rate?

Why is the use of the exit concentration limit treatment alternative inappropriate for systems involving open bio-units?

Case Study - Treatment Options and Standards (Cont'd)

Appendix C

Solutions

Under the provisions of the Subpart CC rules (40 CFR 264 and 265, Subpart CC), air emission controls are no longer required for waste management units that receive hazardous waste when the organic content of the waste has been reduced by a treatment process that meets conditions specified in the rules, §265.1083(c)(2).

Example 1: Steam Stripping

The owner/operator has decided to use the treatment process alternative that involves the determination of the organic reduction efficiency (**R**) in §265.1083(c)(2)(ii). Use of this alternative limits the number and location of the waste VO concentrations that must be made to determine if the treatment system meets the criteria in the rule. For example, since the calculation of **R** is based on the actual VO mass of the waste entering and exiting the treatment process (at **Points A & B**), no data on VO concentrations are needed for the four individual wastes at their point of waste origination (**Points 1 through 4**). Under this treatment alternative, if the organic reduction efficiency (**R**) is greater than or equal to 95% and the VO concentration of the treated waste is less than 100 ppmw, then downstream units managing this waste stream no longer require control for air emissions under Subpart CC.

Review of the data for this treatment unit shows that the organic reduction efficiency (**R**) is equal to 96% and the VO concentration at the point of waste treatment is 32 ppmw (at Point B). This meets the criteria established in §265.1083(c)(2)(ii) of the rule; therefore, the waste management units following the steam stripper do not require control. However, it is important to note that the treatment device, i.e., the steam stripper, a tank in this case, must be controlled for air emissions.

Example 2: Biological Treatment

The owner/operator has decided to use the treatment process alternative that involves the determination of the organic mass biodegradation rate (**MR_{bio}**) and the required mass removal rate (**RMR**) in §265.1083(c)(2)(iv). Use of this alternative is not waste stream specific in that it does not require a 95% reduction for every waste stream; the required mass removal is based on the aggregated organic mass of the untreated waste. This alternative however does require VO concentration data at the point of waste origination (**Points 1 through 4**) for the four individual wastes that comprise the aggregate waste stream in order to calculate the required mass removal rate (**RMR**). Under this treatment alternative, if the actual organic mass biodegradation rate (**MR_{bio}**) is equal to or greater than the required mass removal rate (**RMR**), then downstream units managing this waste stream no longer require control for air emissions under Subpart CC. In addition, bio-units that meet this condition are exempt from the control requirements of the Subpart CC rules; no cover is required for the surface impoundment (i.e., the bio-unit).

Review of the data for this treatment unit shows that the fraction biodegraded for the overall waste stream (**f_{bio}**) is equal to 0.45 and the total mass entering the unit is 47 ppmw; this results in a **MR_{bio}** of 21 ppmw (**f_{bio}** x Mass in). The required organic mass removal rate (**RMR**) as calculated from the VO concentration at the point of waste origination is equal to 17 ppmw. This meets the criteria established in §265.1083(c)(2)(iv) of the rule; therefore, the waste management units following the bio-unit do not require control. In addition, it is important

Case Study - Treatment Options and Standards (Cont'd)
Appendix C
Solutions

to note that the bio-treatment unit, a surface impoundment in this case, also does not require controls for air emissions because the exemption criteria in §265.1086(a)(2) are met.

Example 3: Air Stripping Followed by Biological Treatment

The owner/operator has decided to use the treatment process alternative that involves the determination of the exit concentration limit ($\mathbf{C_T}$) in §265.1083(c)(2)(i). Use of this alternative accommodates mixing of waste streams and accounts for dilution of regulated waste with dilute non-regulated waste streams; this alternative, although waste stream specific, does not require a 95% reduction for every waste stream. This alternative, in order to calculate $\mathbf{C_T}$, requires VO concentration data at the point of waste origination for the four individual wastes (**Points 1 through 4**) that comprise the aggregated waste stream. Under this treatment alternative, if the VO concentration of the treated waste is less than the calculated exit concentration limit ($\mathbf{C_T}$), then downstream units managing this waste stream no longer require control for air emissions under Subpart CC.

Based on the VO concentration of the wastes at their point of waste origination, the exit concentration limit ($\mathbf{C_T}$) is calculated to be 145 ppmw. The VO concentration of the waste stream at the exit of the air stripper (Point B) is 137 ppmw which is less than the required $\mathbf{C_T}$; therefore, the waste stream exiting the air stripper no longer requires management in units that meet the Subpart CC control requirements. However, it is important to note that the treatment device, i.e., the air stripper, a tank in this case, must be controlled for air emissions.

The organic reduction efficiency of the bio-unit is only 45 percent based on the mass entering the unit. This does not comply with the 95 percent requirement in §265.1083(c)(2)(iv); however, because the air stripper meets the treatment requirements, the bio-unit is exempt from the control requirements regardless of the efficiency of the biodegradation process.

Example 4: Steam Stripping Followed by Biological Treatment

The owner/operator is uncertain if the facility's hazardous waste treatment system meets any of the available treatment alternatives and therefore would like to examine the alternatives to determine if and at what point the treatment scheme the facility treatment of the waste meets any of the criteria in §265.1083(c)(2).

Could the owner/operator use the exit concentration limit (C_T) as a treatment performance criteria? This would be acceptable if the owner/operator were examining only the performance of the steam stripper as a treatment device. In this example, however, the $\mathbf{C_T}$ is 453 ppmw and the exit concentration of the steam stripper is 533 ppmw. The performance of the steam stripper is not adequate to meet the performance criteria of §265.1083(c)(2). The steam stripper, a tank in this case, would require control under Subpart CC.

Case Study - Treatment Options and Standards (Cont'd)
Appendix C
Solutions

Use of the exit concentration limit is not appropriate in the case where the bio-unit is considered a part of the overall treatment system. This is because the exit VO concentration does not reflect the actual control efficiency or performance of the treatment system because the air emissions from the bio-unit are not taken into consideration in the calculation of the exit concentration. If the bio-unit were covered and vented to a control device that complied with the Subpart CC requirements then it would be acceptable to use the exit concentration limit criteria.

Does the treatment system meet the required organic mass removal rate (RMR) criteria?
The **RMR** in this example is 1825 ppmw; the VO mass removed by the steam stripper is 1746 ppmw based on the exit VO concentration of the steam stripper. The steam stripper alone is not adequate to meet the treatment criteria of the rule. If the steam stripper and bio-unit are considered together as a treatment system then the mass removed is 2115 ppmw (1746 ppmw for the stripper plus 369 ppmw for the bio-unit). The combined treatment system therefore meets the **RMR** criteria and the waste management units downstream of the bio-unit do not require control.

Does the bio-unit meet the requirements for organic reduction efficiency?
The organic reduction efficiency of the bio-unit is only 69 percent based on the mass entering the unit. This does not comply with the 95 percent requirement in §265.1083(c)(2)(iv); however, because the steam stripper and bio-unit are considered as a combined treatment system and that treatment system meets the mass removal treatment requirements of the rule, the bio-unit is exempt from the control requirements regardless of the low efficiency of the biodegradation process. This exemption only applies in situations where the bio-unit is the unit that ultimately achieves the treatment targets (i.e., the **R** of 95% or the site-specific **RMR** value). In other words, an open bio-unit can not be the first in a series of units within a treatment system that is used to meet the treatment requirements of the Subpart CC rules.

APPENDIX D

PROCEDURE T—CRITERIA FOR PERMANENT TOTAL ENCLOSURE
(SOURCE: 40 CFR 52.741, APPENDIX B)

PROCEDURE T—CRITERIA FOR PERMANENT TOTAL ENCLOSURE (SOURCE: 40 CFR 52.741, APPENDIX B)

Appendix D

Definitions

Natural Draft Opening (NDO)—Any permanent opening in the enclosure that remains open during operation of the facility and is not connected to a duct in which a fan is installed.

Permanent Total Enclosure (PTE)—A permanently installed enclosure that completely surrounds a source of emissions such that all VOC emissions are captured and contained for discharge through a control device.

Criteria of a Permanent Total Enclosure

- Any NDO shall be at least 4 equivalent opening diameters from each VOC emitting point.
- Any exhaust point from the enclosure shall be at least 4 equivalent duct or hood diameters from each NDO.
- The total area of all NDO's shall not exceed 5 percent of the surface area of the enclosure's four walls, floor, and ceiling.
- The average facial velocity (FV) of air through all NDO's shall be at least 3,600 m/hr (200 fpm). The direction of air through all NDO's shall be into the enclosure.
- All access doors and windows shall be closed during routine operation of the process.
- All VOC emissions must be captured and contained for discharge through a control device.

As of Wednesday, January 21, 2004,

e-CFR has moved to a Beta Two version located at: http://www.gpoaccess.gov/ecfr.

Please update all of your bookmarks.