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BENZENE WASTE OPERATIONS NESHAP LEVEL II INSPECTION MANUAL

Prepared by
U. S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Stationary Source Compliance Division

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TABLE OF CONTENTS

<u>Chapter</u>	<u>Page</u>
List of Figures	v
List of Tables	vi
1.0 Introduction	1-1
2.0 Summary of NESHAP Regulations	2-1
2.1 Applicability	2-1
2.2 Waste Determinations	2-3
2.3 Calculating Total Annual Benzene Quantity in Facility Waste (TAB)	2-3
2.4 Applicability of Control Requirements	2-6
2.5 Basic Control Requirements	2-6
2.5.1 Tanks [§61.343]	2-12
2.5.2 Surface Impoundments [§61.344]	2-12
2.5.3 Containers [§61.345]	2-12
2.5.4 Oil-water separators [§61.347]	2-12
2.5.5 Individual Drain Systems [§61.346]	2-13
2.6 Alternative Compliance Options [§61.342(e)]	2-13
2.7 Recordkeeping and Reporting Requirements [§§61.356 and 61.357]	2-15
2.8 Compliance dates	2-16
3.0 EMISSION SOURCES AND CONTROLS	3-1
3.1 Emission Sources and Controls	3-2
3.1.1 Tanks	3-2
3.1.1.1 Organic liquids	3-2
3.1.1.2 Aqueous Wastes (Wastewater)	3-12
3.1.1.3 Sludges	3-16
3.1.1.4 Ancillary Equipment	3-21
3.1.2 Surface Impoundments	3-21
3.1.3 Containers	3-27
3.1.4 Individual Drain Systems	3-28
3.1.5 Oil-water separators	3-31
3.1.6 Land Disposal Sources	3-31
3.2 Emission Controls	3-37
3.2.1 Carbon Adsorption	3-37
3.2.2 Condensation	3-41
3.2.3 Absorption	3-41
3.2.4 Vapor combustion	3-41
3.2.5 Organic removal	3-49
3.2.6 Waste incineration	3-49
3.3 Summary	3-49
4.0 INSPECTION PROCEDURES AND CHECKLISTS	4-1

5.0	HEALTH AND SAFETY	5-1
5.1	Health Hazard Information	5-1
5.2	Safety	5-2
	5.2.1 Personal Protection Equipment	5-2
	5.2.2 Compliance Inspection Safety Guidelines	5-4
5.3	References	5-7

Appendices

A	Various Questions and Answers	A-1
B	Case Study: Questions and Answers	B-1
C	Guidance for Review of 90-Day Reports	C-1
D	List of Environmental Regulations Affecting those Facilities under the Benzene Waste NESHAP	D-1

LIST OF FIGURES

<u>Number</u>		<u>Page</u>
2-1	Overview	
2-2	Applicability	2-2
2-3	The Basic Rule	2-5
2-4	Alternative Standard for Process Wastewater	2-7
2-5	Alternative Treatment Process Standard	2-9
2-6	Treat to a Target Benzene Quantity	2-11
3-1	Typical Fixed-Roof Tank	2-14
3-2	Covered Tanks (Working Losses)	3-4
3-3	Covered Tanks (Breathing Losses)	3-5
3-4	Internal Floating Roof	3-6
3-5	External Floating Roof	3-8
3-6	Emission Sources for Distillation	3-9
3-7	Emissions from Solvent Extraction	3-11
3-8	Schematic Diagram of an Air Stripping System	3-13
3-9	Steam Stripper for Ethylene Dichloride/ Vinyl Chloride	3-15
3-10	Preliminary Treatment Prior to Stripping	3-17
3-11	Belt Filter Press	3-18
3-12	Flow Path of Thin-Film Evaporator	3-20
3-13	Fate of Organics: Emission, Effluent, Biodegradation, Sludge	3-22
3-14	Splash Loading vs. Submerged Loading	3-25
3-15	Individual Drains	3-29
3-16	Typical Junction Box	3-30
3-17	Oil-Water Separator	3-32
3-18	Land Treatment Emission Mechanisms	3-33
3-19	Emissions from a Closed Landfill	3-35
3-20	Carbon Canisters	3-36
3-21	Two-Stage Adsorption System	3-39
3-22	Schematic Diagram of a Contact Condenser	3-40
3-23	Schematic Diagram of a Shell-and-Tube Surface Condenser	3-42
3-24	Packed Tower for Gas Absorption	3-43
3-25	Schematic of the Basic Components of a Steam-Assisted Elevated Flare System	3-44
3-26	Thermal Incinerator	3-46
3-27	Catalytic Oxidizer	3-47
		3-48

LIST OF TABLES

<u>Number</u>		<u>Page</u>
3-1	Major Factors Affecting Emissions	3-23
5-1	Exposure Limits for Benzene	5-2

1.0 INTRODUCTION

This document was prepared to assist EPA Regional Offices and State/local air quality control agencies in implementing the National Emission Standards for Hazardous Air Pollutants (NESHAP) for Benzene Emissions from Waste Operations as presented in the Code of Federal Regulations (40 CFR Part 61, Subpart FF). The manual is intended to provide basic guidance to enable the inspector to systematically and comprehensively gather the necessary information from visual and recordkeeping inspections to determine facility compliance with the benzene waste operations NESHAP regulations, using Level II inspection techniques. For additional inspection of benzene sources, this manual should be used in conjunction with the "Benzene Equipment Leak Inspection Manual," EPA 340/1-90-001 which covers benzene equipment leaks (40 CFR 61, Subpart J, Subpart L, and Subpart Y).

The manual is divided into five sections including this introduction. The second section contains a summary of the NESHAP regulation. The summary provides an overview of the Subpart FF history, applicability, exemptions, waste determinations, total annual benzene quantity from facility waste (TAB) determinations, compliance approaches, control requirements, and reporting and recordkeeping requirements. The third section describes the sources of benzene air emissions at waste management operations, how these emissions occur, and how they are controlled. Section four provides detailed inspection checklists targeting regulated equipment and recordkeeping activities. The checklists are designed to assist the inspector in determining facility compliance through visual inspection techniques that require little or no equipment. The checklists are formatted by regulated equipment item and present in a cookbook manner the necessary inspection items. The final section addresses health risks associated with benzene, and recommends guidelines for conducting safe inspections. In addition, this document includes four appendices: (1) Appendix A: related questions and answers; (2) Appendix B: case studies

designed to assist the inspector's overall understanding of the regulations and ability to determine source compliance. Answers are provided with a brief explanation for each noncompliance item; (3) Appendix C: a guidance document for review of 90-day reports; and (4) Appendix D: a summary of air and non-air federal regulations affecting the regulated industries.

2.0 SUMMARY OF NESHAP REGULATIONS BENZENE WASTE OPERATIONS

On March 7, 1990, (55 FR 8292), the EPA promulgated under section 112 of the Clean Air Act (CAA) (prior to the 1990 amendments) 42 U.S.C. 7412, National Emission Standards for Hazardous Air Pollutants (NESHAP) to control emissions of benzene to ambient air from waste operations. Subsequent to promulgation, the EPA stayed the effectiveness of Subpart FF (57 FR 8012, March 5, 1992), and proposed clarifying amendments to Subpart FF (57 FR 8017, March 5, 1992). The final amendments were signed by the Administrator on December 1, 1992 and the stay was removed. The final amendments were published in the Federal Register on January 7, 1993 (58 FR 3072).

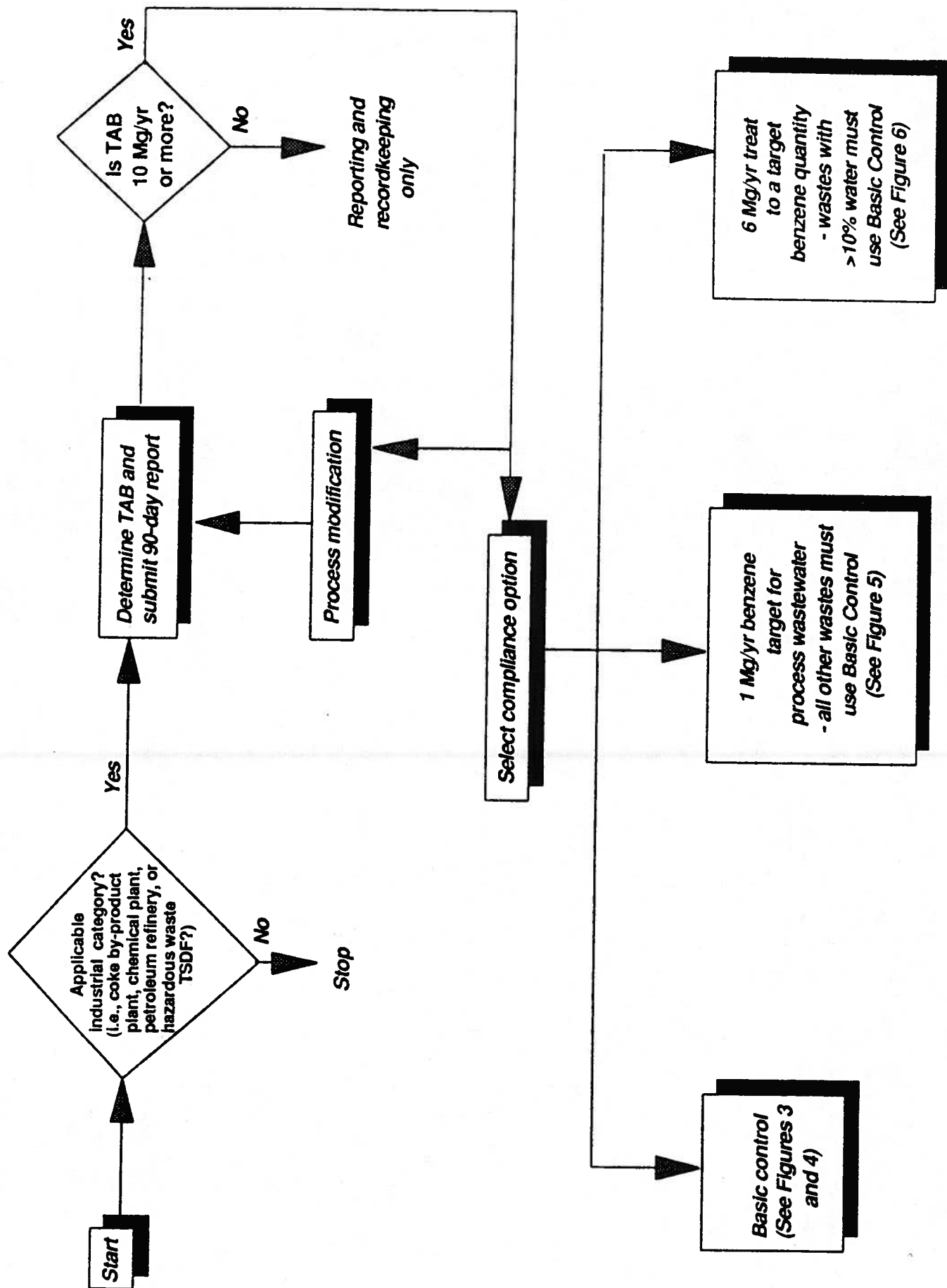
The requirements will reduce industry-wide benzene emissions during benzene waste operations at chemical manufacturing plants, petroleum refineries, coke by-products recovery plants, and hazardous waste treatment, storage, and disposal facilities.

A summary of the standards is presented below. The summary describes applicability, total annual benzene quantity (TAB) calculations, exemptions, requirements, compliance options, reporting and recordkeeping requirements and compliance dates set forth in the standard. Complete details on the requirements are presented in the promulgated final regulations published in 40 CFR Part 61, Subpart FF.

2.1 Applicability

The benzene waste operations NESHAP is applicable to four industrial categories - chemical manufacturing plants, petroleum refineries, coke by-product plants, and offsite hazardous waste treatment, storage, and disposal facilities (TSDF) that receive wastes from any of these three industries. The waste streams at hazardous waste TSDF subject to the provisions of this subpart are the benzene-containing waste from any of the above named facilities. See Figure 2-1.

FIGURE 2-1. OVERVIEW



2.2 Waste Determinations

The definition of "waste" used for the benzene waste operations NESHAP at §61.341 is the same definition used for other CAA standards (specifically the volatile organic liquid (VOL) storage New Source Performance Standard [NSPS] in 40 CFR Part 60 Subpart Kb). This is not the same definition of waste used for the Resource Conservation and Recovery Act (RCRA) rules. The waste definition used for the benzene waste operations NESHAP is very broad and generally includes all waste materials generated at a facility except for those waste materials specifically excluded under the applicability section of the rule. The exclusions in the benzene waste operations NESHAP include (1) wastes in the form of gases and vapors, and (2) wastes managed in segregated stormwater sewer systems (i.e., a sewer system used exclusively for collecting rainfall runoff at a facility). Once a liquid or solid waste stream exits the process unit that generates the waste, that waste stream is regulated by this rule even if the material eventually is recycled or recovered.

2.3 Calculating Total Annual Benzene Quantity in Facility Waste (TAB)

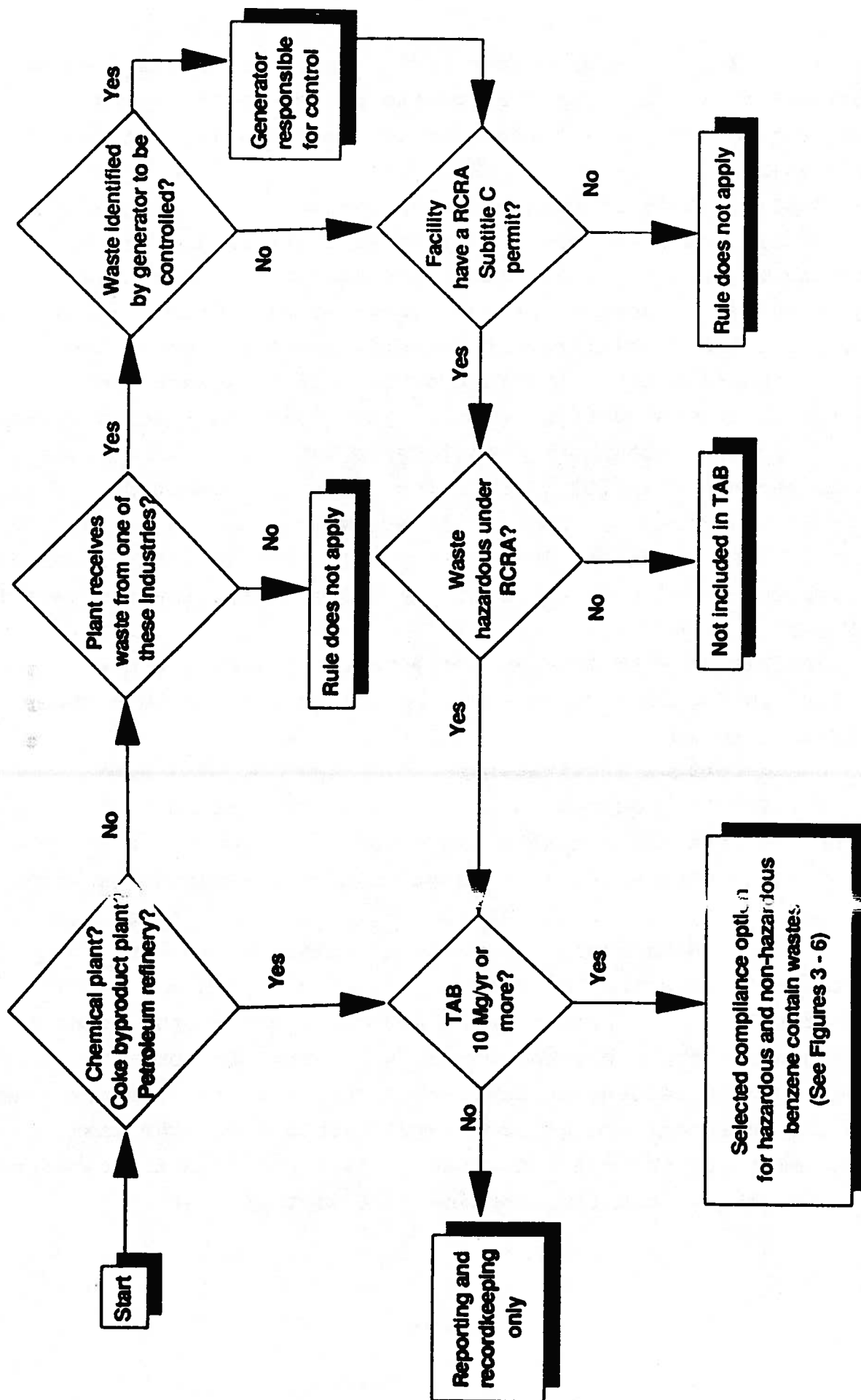
To avoid requiring facilities with low benzene emission potential to be subject to the treatment and control standards of the rule, a 10 Megagram per year (Mg/yr) cutoff level is specified in the rule. This cutoff level identifies which facilities in the four affected industrial categories have the potential for presenting significant risks to human health as a result of benzene emissions from waste operations, and consequently, need to treat and control benzene-containing waste streams. The cutoff level is based on the quantity of total annual benzene in the waste managed at the facility (TAB). The EPA determined that those facilities in the affected industrial categories with a facility-wide TAB of 10 Megagrams per year (Mg/yr) or more need to control certain waste streams containing benzene in order to achieve the EPA risk policy goals.

A facility's TAB is calculated by summing the annual quantity of benzene in all aqueous waste streams managed at a facility. An aqueous waste, for purposes of implementing the rule, is a waste with a water content of 10 percent or more, or that at any time is mixed with water or other wastes and the resulting mixture has a water content of 10 percent or greater.

For the purpose of calculating the facility-wide TAB, an owner or operator can determine the waste stream quantities and benzene content by direct measurement [§61.355(c)(3)] or by knowledge of the process or operation that generates the waste [§61.355(c)(2)]. The characteristics of the waste stream for calculating TAB are determined at the "point of generation." The definition of point of waste generation as used for the rule at §61.341 is the location where the waste stream exits the process unit component or storage tank prior to handling or treatment in an operation that is not an integral part of the production process, or in the case of waste management units that generate new waste after treatment, the location where the waste stream exits the waste management unit component. Determining the waste benzene quantity at this location ensures that all potentially significant sources of benzene emissions from waste operations at these facilities are regulated. See Figure 2-2. Note that in applying the rule, there are exceptions to this general definition for a few special situations (e.g., coke by-product recovery plants regulated by 40 CFR 61 Subpart L, hazardous waste TSDF, and petroleum refinery sour water strippers) [§61.355(b)].

The following wastes are among those that also must be included in the TAB: (1) materials subject to Subpart FF that are sold and (2) wastes that may be exempted from control under the rule based on low benzene concentration, low benzene quantity, and low total waste quantity [§61.342]. Remediation wastes are not counted in the facility TAB, but are subject to control if the facility's TAB is 10 Mg/yr or greater. In addition, facilities may elect to average the benzene in process unit turnaround wastes in the calculation of facility TAB. A

FIGURE 2-2. APPLICABILITY



facility selecting this option would report an annual average contribution to facility TAB for the process unit regardless of whether the unit had a turnaround in the reporting year [§61.355(b)(4)].

2.4 Applicability of Control Requirements

Facilities with less than 1 Mg/yr total annual benzene quantity in facility waste (TAB) are exempted from control requirements and most reporting requirements. These facilities must submit an initial report and maintain a record of the initial determination. No further reporting is required unless the total benzene waste quantity may increase to 1 Mg/yr or more.

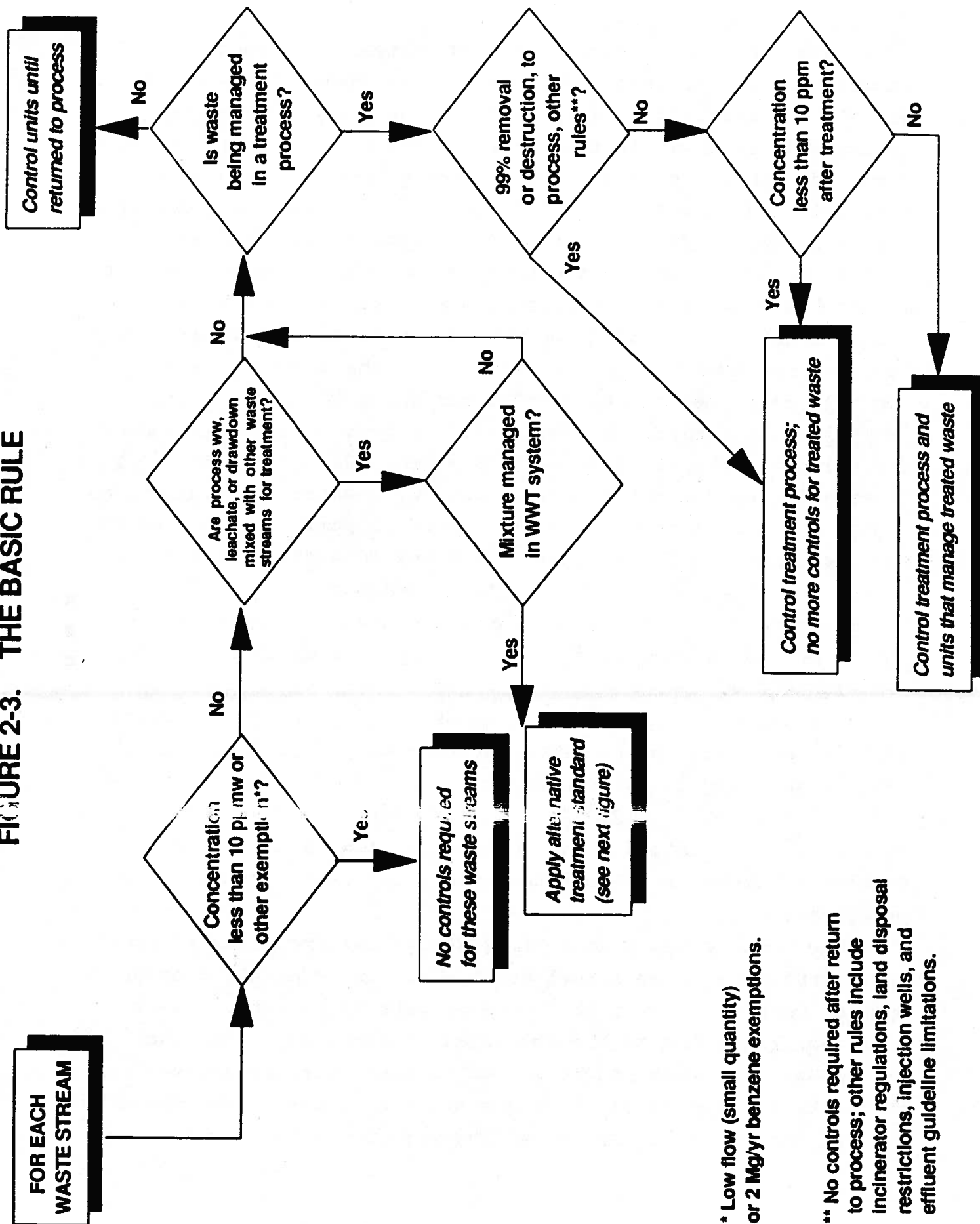
Facilities with more than 1 Mg/yr but less than 10 total annual benzene quantity in facility waste are exempt from any control requirements. These facilities must determine the facility TAB, submit an initial report, and update and resubmit the report annually or whenever the TAB quantity may increase to 10 Mg/yr or more.

Facilities with 10 Mg/yr or more total annual benzene quantity in facility waste must control certain waste streams containing benzene.

2.5 Basic Control Requirements

The NESHAP requires that certain waste streams containing benzene be treated, not allowing dilution to remove or destroy benzene, and each waste management unit that manages the waste prior to and during treatment must have emission controls. See Figure 2-3. In general, the waste streams that require control are those streams that have an annual average benzene concentration of 10 ppmw or more as determined at the point of waste generation. In other words, all waste streams with an annual average benzene concentration less than 10 ppmw are exempt from the treatment and control requirements under the basic requirements of the rule; however, this may not be the case under the alternative compliance option (see section 2.6).

FIGURE 2-3. THE BASIC RULE



* Low flow (small quantity) or 2 Mg/yr benzene exemptions.

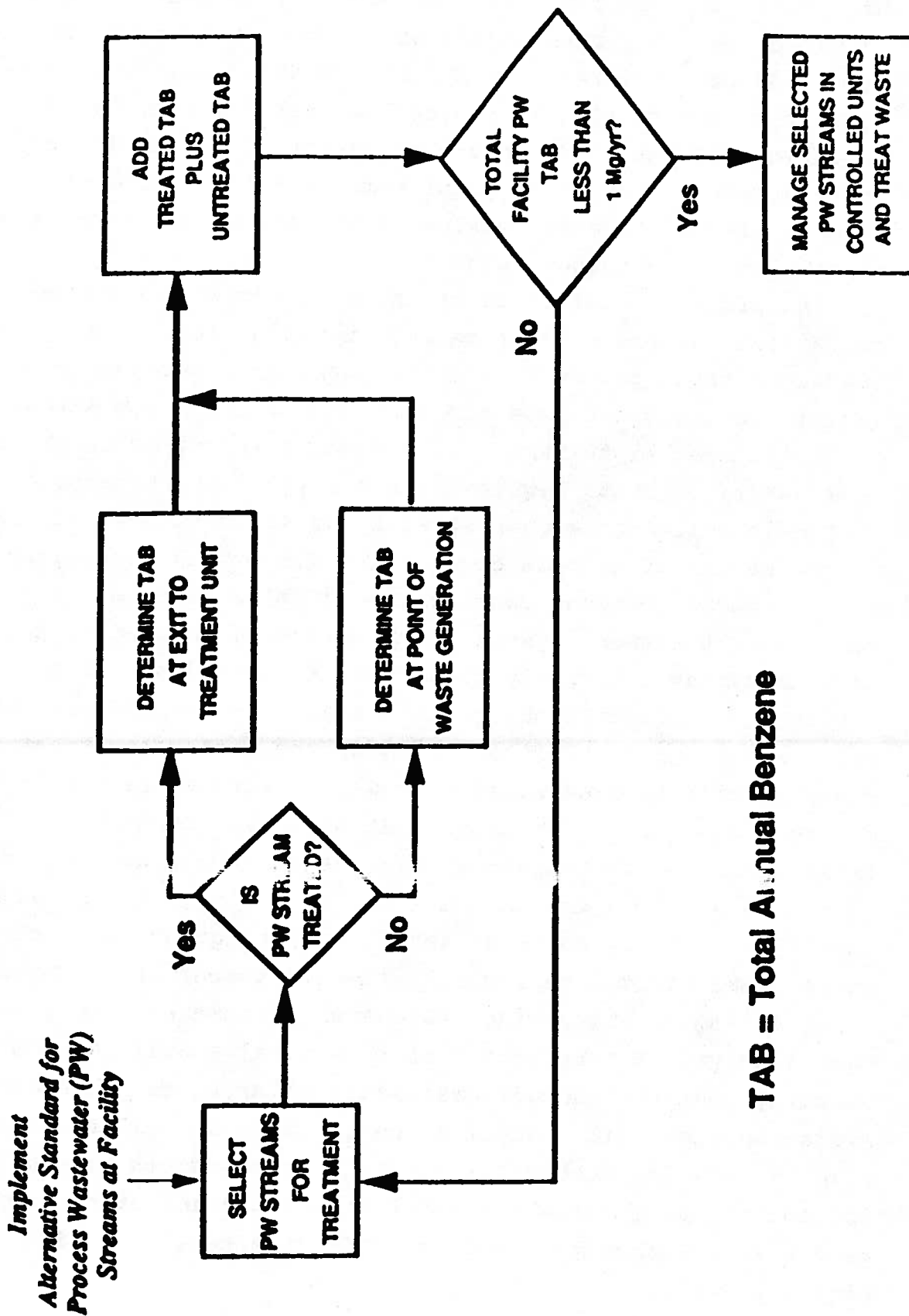
** No controls required after return to process; other rules include incinerator regulations, land disposal restrictions, injection wells, and effluent guideline limitations.

Under the rule, certain process wastewater streams are exempt from the treatment and control requirements. Process wastewater is specifically defined in the rule as water that contacts benzene within the manufacturing process unit. Specific examples of waste streams that are not process wastewater are listed in the rule [§61.341 definition]. A process wastewater stream is exempt from controls if it meets one of two flow conditions regardless of the benzene content of the stream. If either the flow rate of a process wastewater is less than 0.02 L/min or the total mass flow rate of a process wastewater stream is less than 10 Mg/yr, it is exempt from the treatment and control requirements. As an alternative to these flow-rate exclusions, the owner or operator can choose to meet a standard for all process wastewater streams at an affected facility. This alternative standard excludes process wastewater streams with an annual average benzene concentration of 10 ppmw or more from the treatment and control requirements provided sufficient process wastewater streams are treated (in accordance with the requirements of the rule) to reduce the total amount of benzene in all process wastewaters at a facility to less than 1 Mg/yr. See Figure 2-4.

Another alternative allows an owner or operator to exempt a waste stream from the control requirements if the total annual benzene quantity in all waste streams chosen for exemption does not exceed 2.0 Mg/yr [§61.343(c)(2)]. The owner or operator utilizing this exemption may not choose to exempt process wastewater under the flow rate exclusions stated in the above paragraph.

The benzene waste operations NESHAP requires that affected waste streams with an annual average benzene concentration of 10 ppmw or more be treated to remove or destroy benzene. These treatment requirements are specified in terms of performance standards. The rule requires that each affected individual waste stream be treated to (1) remove benzene from the waste stream to a level less than 10 ppmw on a flow-weighted annual average

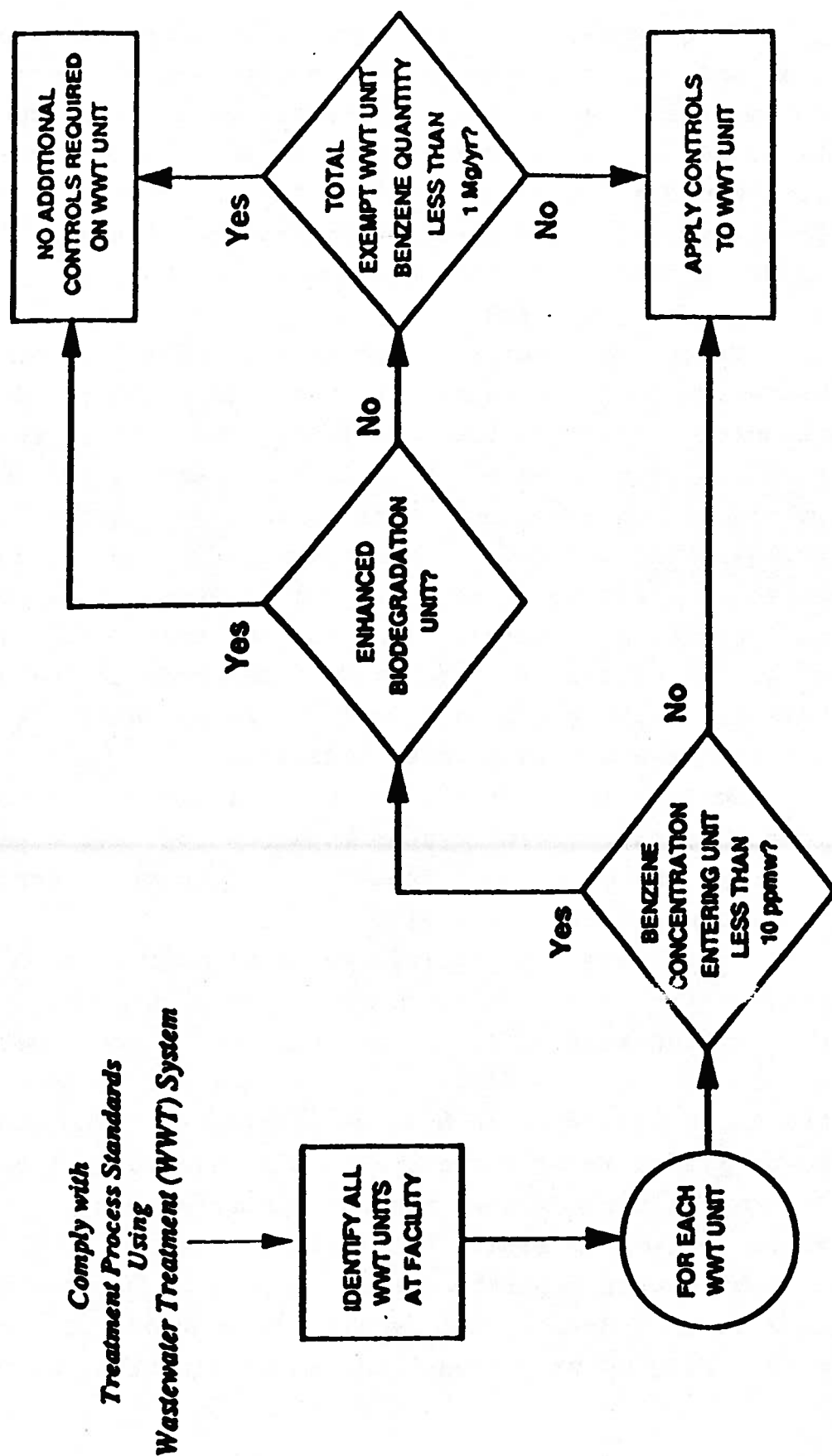
FIGURE 2-4. ALTERNATIVE STANDARD for PROCESS WASTEWATER



basis; (2) remove or destroy the quantity of benzene in the waste by 99 percent on a mass basis; or (3) comply with the treatment standards of other relevant EPA standards (i.e., RCRA waste combustion rules, RCRA land disposal restrictions, benzene-specific effluent guidelines and standards). Dilution of the waste stream to appear in compliance with the treatment standards is prohibited. However, mixing of waste to facilitate treatment is allowed as described below.

At affected facilities having many wastewater streams containing benzene such as petroleum refineries, owners and operators often prefer to combine wastewater streams to facilitate treatment in a single process. For this situation, there are special treatment requirements specified in the rule [§61.348(b)]. These requirements apply to a wastewater treatment system in which wastewater streams having annual average benzene concentration of 10 ppmw or more are mixed with wastewater having annual average benzene concentrations below 10 ppmw. A wastewater treatment system is specifically defined in the rule as a unit that ultimately discharges in accordance with a National Pollutant Discharge Elimination System (NPDES) permit. All waste management units making up the wastewater treatment system handling these mixed wastewater streams are required to use controls except for units that meet two conditions. The first condition is the annual average benzene concentration of the waste entering the unit is less than 10 ppmw. The second condition is that the total annual benzene quantity in the wastewaters first entering all affected uncontrolled units constituting facility-wide wastewater treatment systems is less than 1 Mg/yr. Determination of this total annual benzene quantity does not include wastewater entering an enhanced biodegradation unit. Application of these special treatment requirements for wastewater treatment systems can be complex. For additional information about this provision of the rule, the reader is referred to the case study in Appendix B. See Figure 2-5.

FIGURE 2-5. ALTERNATIVE TREATMENT PROCESS STANDARD



In general, the basic control requirements are to cover the unit and vent the unit through a closed-vent system to a control device that removes or destroys the organics in the vent system by 95 percent. The affected units are tanks, surface impoundments, containers, oil-water separators, and individual drain systems. The specific control requirements for each type of waste management unit are summarized below.

2.5.1 Tanks [§61.343]

Tanks are required to be covered with a fixed roof, which is vented through a closed-vent system to a control device that removes or destroys the organics in the vent stream by 95 percent. For tanks in which organic waste (less than 10 percent water) are managed, only a fixed roof is required if other criteria are met (e.g, vapor pressure and tank size cutoff). As an alternative to using a fixed roof vented to a control device, an internal or external floating roof that meets the requirements of 40 CFR 60.112(a) (Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels) can be used.

2.5.2 Surface Impoundments [§61.344]

Surface impoundments are required to be covered and vented through a closed-vent system to a control device that removes or destroys the organics in the vent stream by 95 percent.

2.5.3 Containers [§61.345]

Containers are required to be tightly covered except when waste is being added to or removed from the container. Waste that is transferred (i.e., pumped) into a container must be added by submerged fill. If the container is used for certain treatment processes such as waste fixation, the container needs to be placed in an enclosure that is vented to a control device during the periods when the container is open.

2.5.4 Oil-water separators [§61.347]

Oil-water separators are required to be covered and vented to a control device that removes or destroys the organics in the vent stream by 95 percent. As an alternative, an owner or

operator may elect to use a floating roof or comply with the requirements specified in the Petroleum Refinery Wastewater System NSPS (40 CFR 60 Subpart QQQ).

2.5.5 Individual Drain Systems [§61.346]

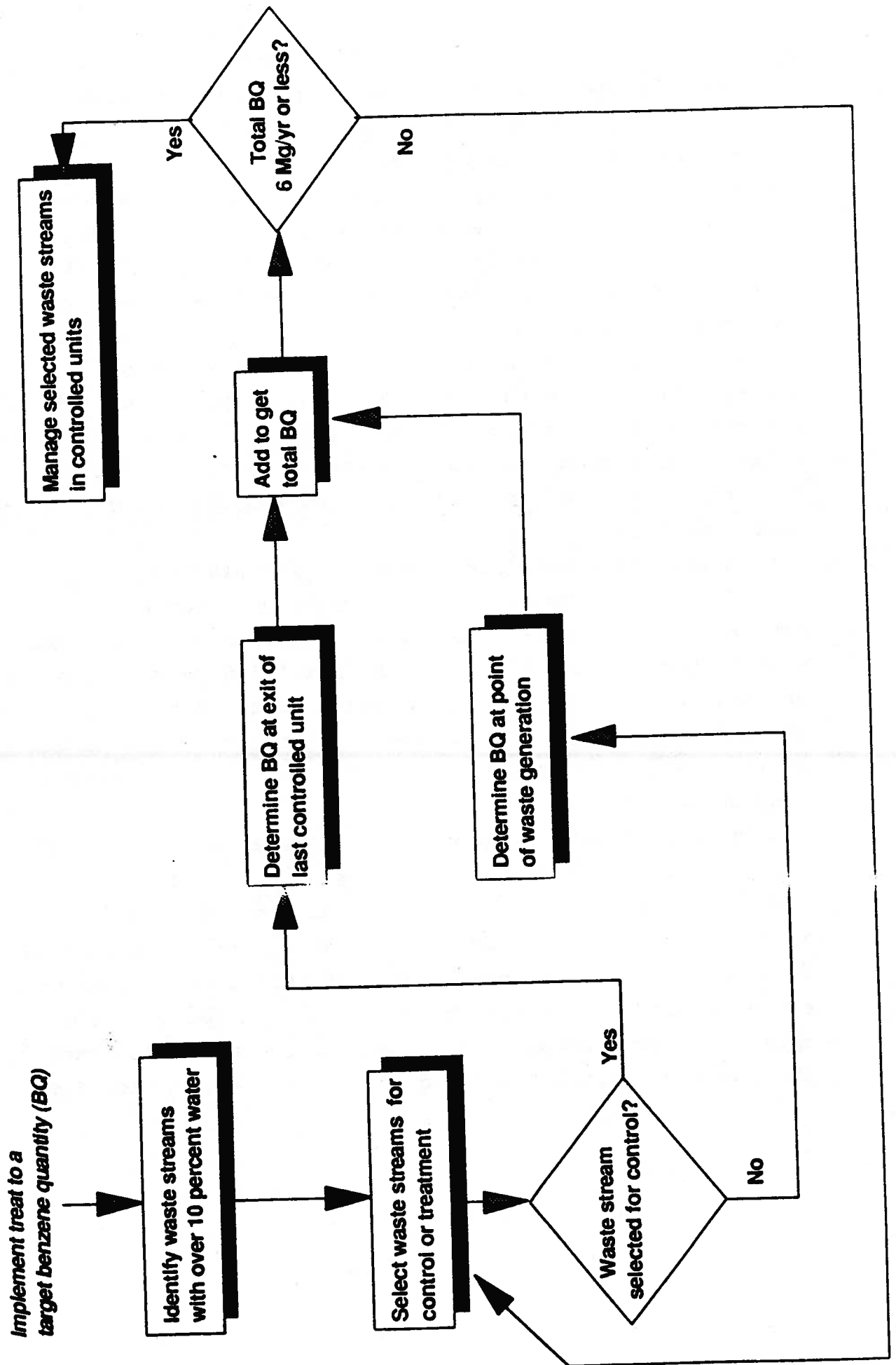
Individual drain systems are required to have covers installed and a closed-vent system that routes all organic vapors from the drain system to a control device. As an alternative, an owner or operator may elect to comply with requirements similar to those specified in 40 CFR 60 Subpart QQQ and, in addition, control junction box emission by equipping the junction box with a system to prevent the flow of organic vapors from the junction box vent pipe during normal operation (e.g., water seals on the inlet sewer line connections to the junction box) or connecting the vent pipe to a closed-vent system and control device (e.g., a carbon canister).

2.6 Alternative Compliance Options [§61.342(e)]

Under this provision, an owner or operator may choose to control or treat any combination of aqueous waste streams that contain benzene provided that the resulting benzene quantity is maintained below 6.0 Mg/yr. Organic wastes are required to be managed in units controlled for benzene air emissions as they would be without the target benzene quantity alternative compliance option.

To determine compliance under this alternative, a facility must determine its benzene quantity. The facility benzene quantity is determined by summing the mass of benzene in all aqueous wastes subject to the rule at the point where each waste first enters a waste management unit that is not controlled for air emissions as required by the rule. A facility choosing this option is not allowed to use the process wastewater exemption or the 2.0 Mg/yr small benzene quantity exemption. See Figure 2-6.

FIGURE 2-6. TREAT TO A TARGET BENZENE QUANTITY



2.7 Recordkeeping and Reporting Requirements [§§61.356 and 61.357]

Owners and operators of facilities subject to the standards must report the initial determination of the TAB and also determine which waste streams must be controlled within 90 days of the effective date (April 7, 1993). A record of these determinations must be maintained at each facility, including documentation to support a conclusion that controls are not required.

To ensure that the treatment processes and emission control equipment are properly operated and maintained, the rule requires the owner or operator to install instrumentation to continuously monitor the treatment process and control device operation continuously and to conduct monthly effluent testing from treatment processes. Emission control equipment covers must be visually checked at least quarterly to ensure that the equipment is being used properly (e.g., covers are closed and latched except when workers require access to a tank or container) and that the equipment is being maintained in good condition (e.g., no holes or gaps have developed in covers). Annual leak detection monitoring using EPA Reference Method 21 is required for closed-vent systems to ensure all fittings remain leak-tight.

As a means of verifying compliance, recordkeeping and reporting requirements are specified in the rule. The owner or operator is required to record certain information documenting all waste determination results, treatment and control equipment design, and inspection and monitoring results. This information must be maintained in onsite facility files for at least 2 years and must be readily available for review by EPA enforcement personnel during onsite compliance inspections. Certain information must be reported to EPA regularly including quarterly and annual reports documenting inspection and incidences of upset for the treatment processes and control devices.

2.8 Compliance dates

The final amended standards for benzene waste operations were promulgated on January 7, 1993. All affected facilities must be in compliance on or before April 7, 1993, have received an approved waiver of compliance, or entered into an enforcement agreement.

3.0 EMISSION SOURCES AND CONTROLS

The major sources of air emissions from waste management operations, how these emissions occur, and their control are the focus of this chapter. The major sources that are discussed in detail include surface impoundments, the very broad and diverse category of tanks and ancillary equipment, containers, and other major land disposal sources. As each source is described, controls that are inherent to that source or commonly found on that particular source are presented. In addition, details are provided on the basic mechanisms by which emissions occur and the major factors that affect the emissions.

After the discussion of sources and their inherent controls, air pollution control devices that may be generally applicable to any enclosed or vented source (i.e., add-on controls) are described. The discussion of control devices focuses on their applicability, control performance, and the major factors affecting performance. Organic removal (i.e., waste pretreatment) and destruction processes are also discussed as a means of controlling air emissions and reducing or eliminating the emission potential. This discussion describes processes that remove or destroy the organics in the waste, which may eliminate the need to control subsequent waste processing steps.

The types of sources associated with waste management operations, inherent controls that are typically part of the construction and operation of the sources, and emission mechanisms are covered in this chapter. As each source is discussed, covers and enclosures that are specifically applicable to the source, as well as simple work practices that reduce emissions, are described. Other emission controls that are broadly applicable to many of the individual sources are discussed collectively in the second part of this chapter. These controls include traditional air pollution control devices, processes that remove the organics before the waste is placed in units with a high emission potential, and waste incineration.

The discussion of emission sources is divided into six categories: the very broad and diverse group of tanks and ancillary equipment, surface impoundments, containers, individual drain systems, oil-water separators, and land disposal sources that are expected to be most affected by the land disposal restrictions (LDR) (40 CFR 268, Subparts C and D). The major focus is on the first five categories because they are the most directly impacted by the NESHAP.

3.1 Emission Sources and Controls

3.1.1 Tanks

The most diverse group of waste management sources falls into the category of tanks, which is broadly defined. If the unit is not a land disposal source, it is probably a tank. A tank is defined in the Benzene Waste NESHAP as "a stationary device, designed to contain an accumulation of waste and is constructed primarily of nonearthen materials (e.g., wood, concrete, steel, plastic) which provide structural support." A tank system is defined as a tank and its ancillary equipment, and ancillary equipment includes such devices as piping, fittings, flanges, pumps, and valves. Subpart FF regulates tanks under §61.343 and alternative standards for tanks under §61.351.

The category of tanks and tank systems includes a discussion of those units that are easily identified as tanks, such as fixed-roof storage tanks. It also includes wastewater treatment tanks that are typically open; units that perform separation processes, such as columns used for distillation, absorption, and solvent extraction; units used for dewatering; and devices used for waste fixation. The discussion of tanks is divided into four groups: (1) those used primarily for managing organic liquids, (2) those used for aqueous wastes, (3) those used for sludges, and (4) the miscellaneous equipment items associated with tanks.

3.1.1.1 Organic liquids

Organic liquids are usually managed in covered or enclosed tanks, including those with fixed roofs, those with floating roofs, and pressure tanks. A fixed-roof tank uses a cover that

is mounted on a waste management unit in a stationary manner and does not move with fluctuations in liquid level. Fixed-roof tanks are the most common type of storage tank utilized in waste management operations. Emissions occur through the tank's vent, which may be open to the atmosphere, equipped with a pressure-vacuum relief valve, conservation vent, or vented to a pollution control device.

The fixed roof may have several openings in addition to the vent, such as a manhole for tank entry, a hatch used for measuring the liquid level, or an overflow pipe (Figure 3-1). The pressure-vacuum relief valve or conservation vent permits small changes in the liquid level without pushing out the tank's vapors. If the tank has a conservation vent or is vented to a control device, the other openings on the tank must be kept closed and sealed for the emission controls to be effective.

Emissions from fixed-roof tanks occur primarily by working losses and, to a lesser extent, by breathing losses. The quantity is most directly affected by the rate at which vapors are pushed from the tank and the volatility of the tank's contents. These emissions are increased by heating or aeration. Working losses occur when waste is pumped into the tank and vapors are pushed out by the rising level of liquid (Figure 3-2). Breathing losses occur when the volume of vapor in the tank is increased because of changes in ambient temperature or pressure (Figure 3-3).

Equations developed by the American Petroleum Institute (API) are used to estimate emissions for organic liquids. The basic form of the equation, which can be used for other types of wastes, estimates the volume of vapor pushed out from the amount of liquid pumped in. The concentration of organics in the vapor can be measured or estimated.

In most cases, breathing losses are usually very low compared to working losses and can often be neglected. Also, if the tank is operated at a constant liquid level, as some

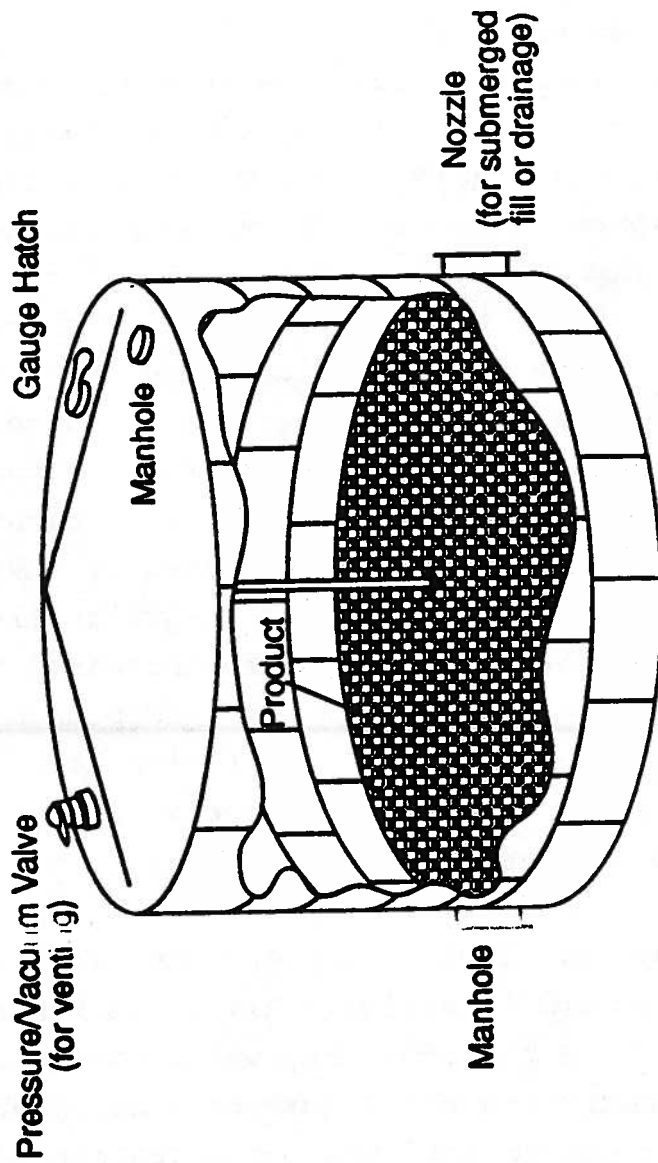


Figure 3-1. Typical Fixed-Roof Tank

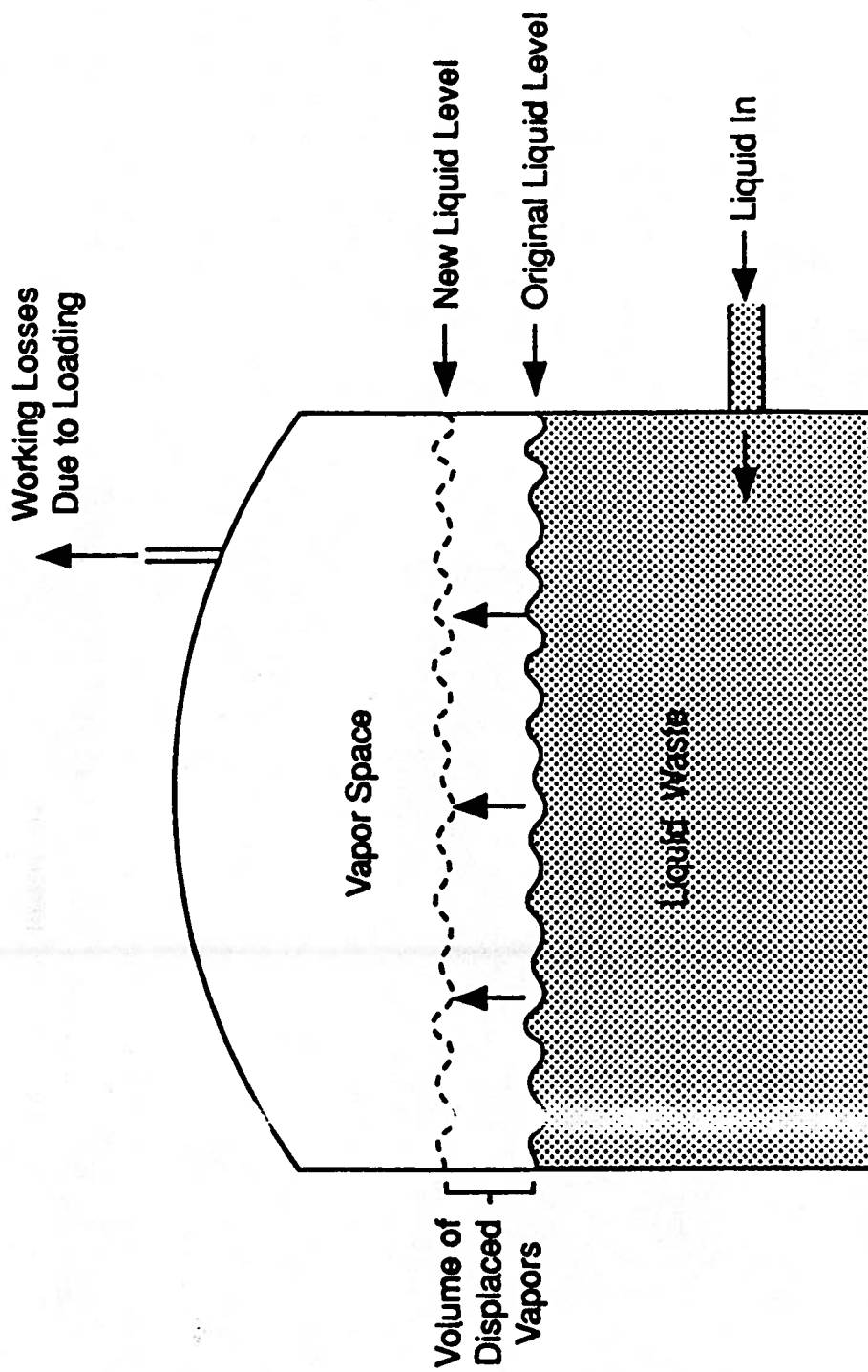


Figure 3-2. Covered Tanks (Working Losses)

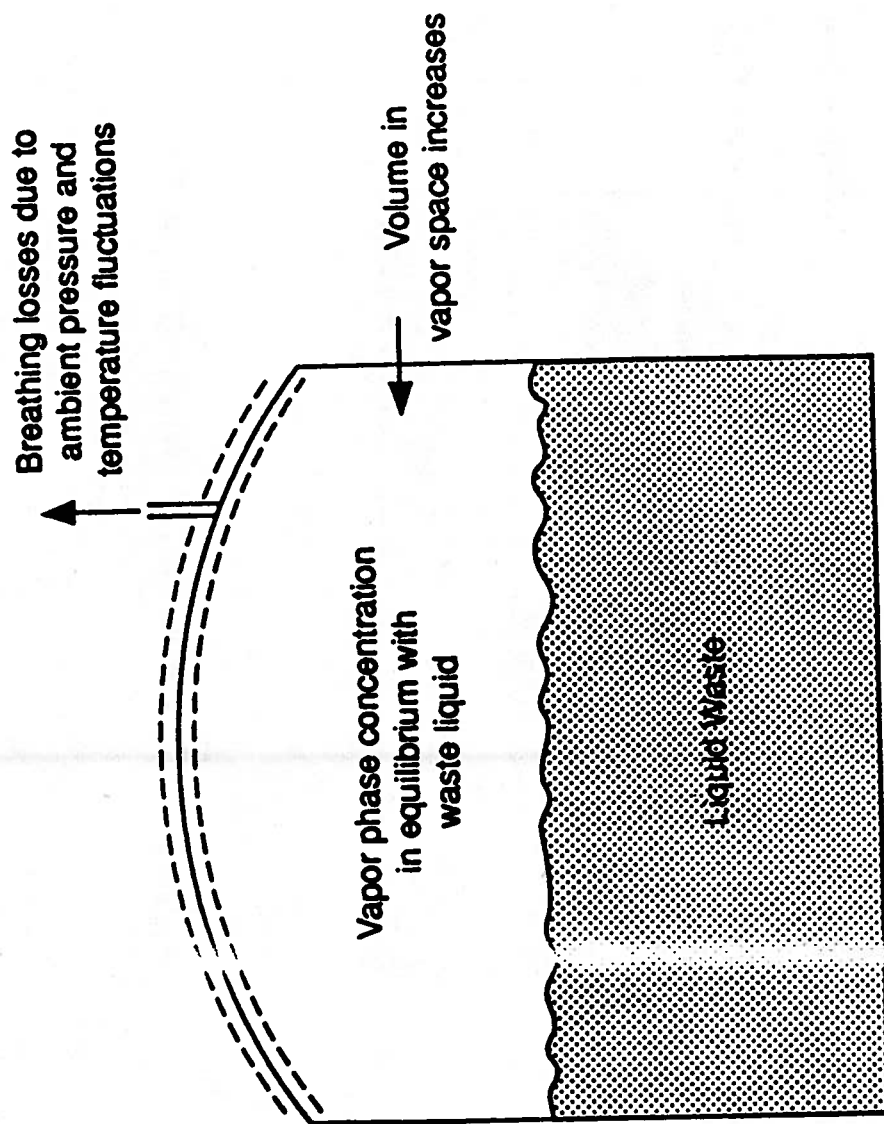


Figure 3-5. Covered Tanks (Breathing Losses)

separators and collection tanks are, very little vapor is displaced and working losses are small.

As an emission control option, open tanks can be retrofitted to fixed-roof tanks, or a fixed-roof tank can be used to replace an open tank or impoundment. Compared to an open tank, a fixed-roof tank can provide additional control of about 86 to 99 percent, depending on the waste volatility and the operating characteristics of the open tank. If the fixed-roof tank is constructed to withstand pressures of 2.5 psig, an additional control of 20 to 45 percent can be obtained. (Most tanks are not designed and constructed to withstand this pressure.)

Floating roof tanks are common at petroleum refineries and gasoline marketing facilities for the storage of volatile liquids. A floating roof tank uses a cover with certain rim sealing mechanisms consisting of a double deck, pontoon single deck, internal floating cover or covered floating roof, which rests upon and is supported by the liquid being controlled, and is equipped with a closure seal or seals to close the space between the roof edge and unit wall. The floating roof can be installed internally (Figure 3-4) in a fixed-roof tank or externally without a fixed roof. An internal floating roof uses a cover that rests or floats on the liquid surface inside a waste management unit that has a fixed roof. An external floating roof uses a pontoon-type or double-deck type cover with certain rim sealing mechanisms that rests on the liquid surface in a waste management unit with no fixed roof. In either case, the roof floats on the liquid and moves with changes in the liquid level, thus controlling (minimizing) working losses. Emissions from a properly maintained floating roof are very low and occur from standing losses and withdrawal losses.

The equipment associated with an external floating roof tank is shown in Figure 3-5. Standing losses occur at the deck seals and at openings for fittings in the floating roof. Withdrawal losses occur from the evaporation of volatiles on the wetted wall as liquid is removed from the tank and the roof descends.

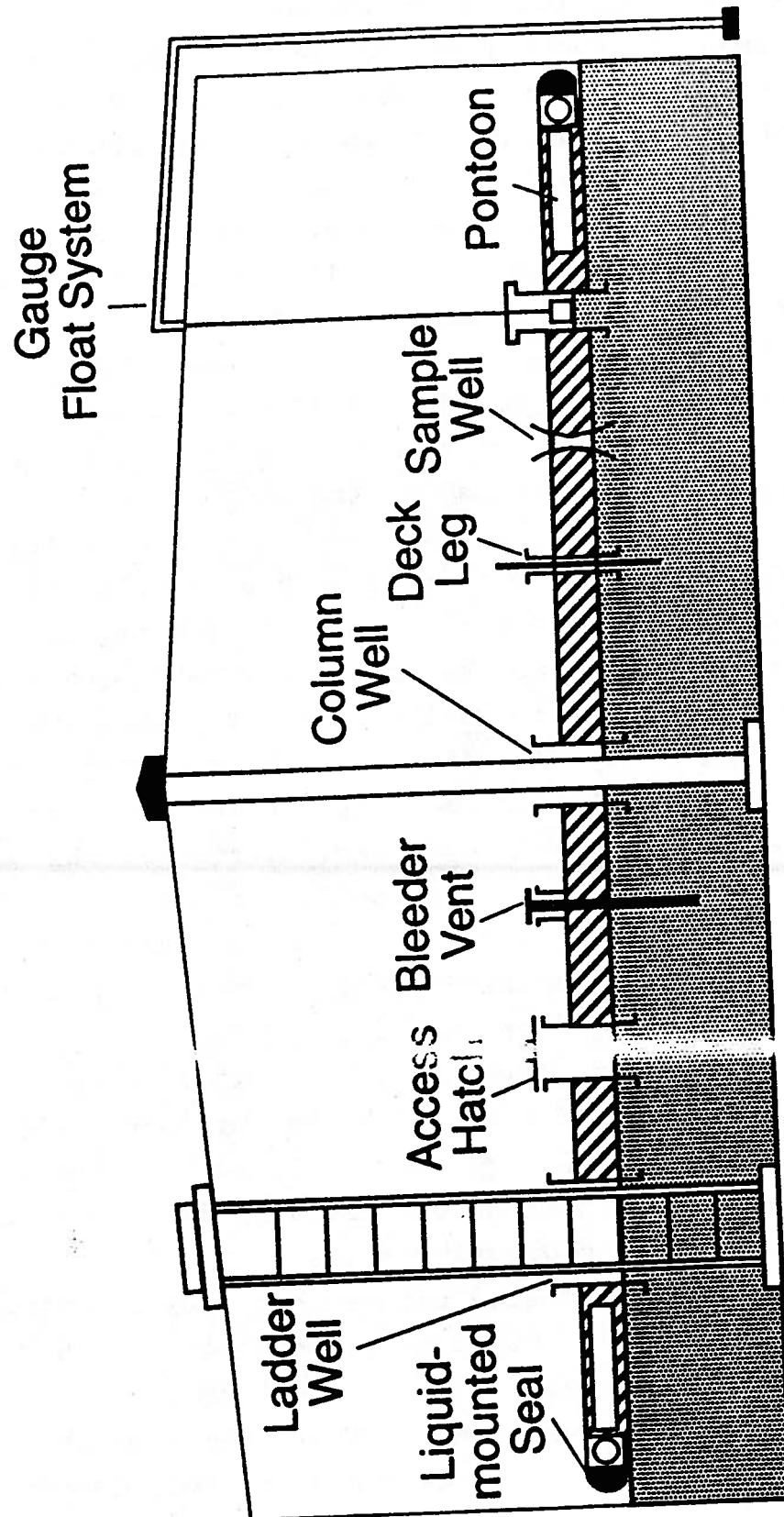


Figure 3-4. Internal Floating Roof

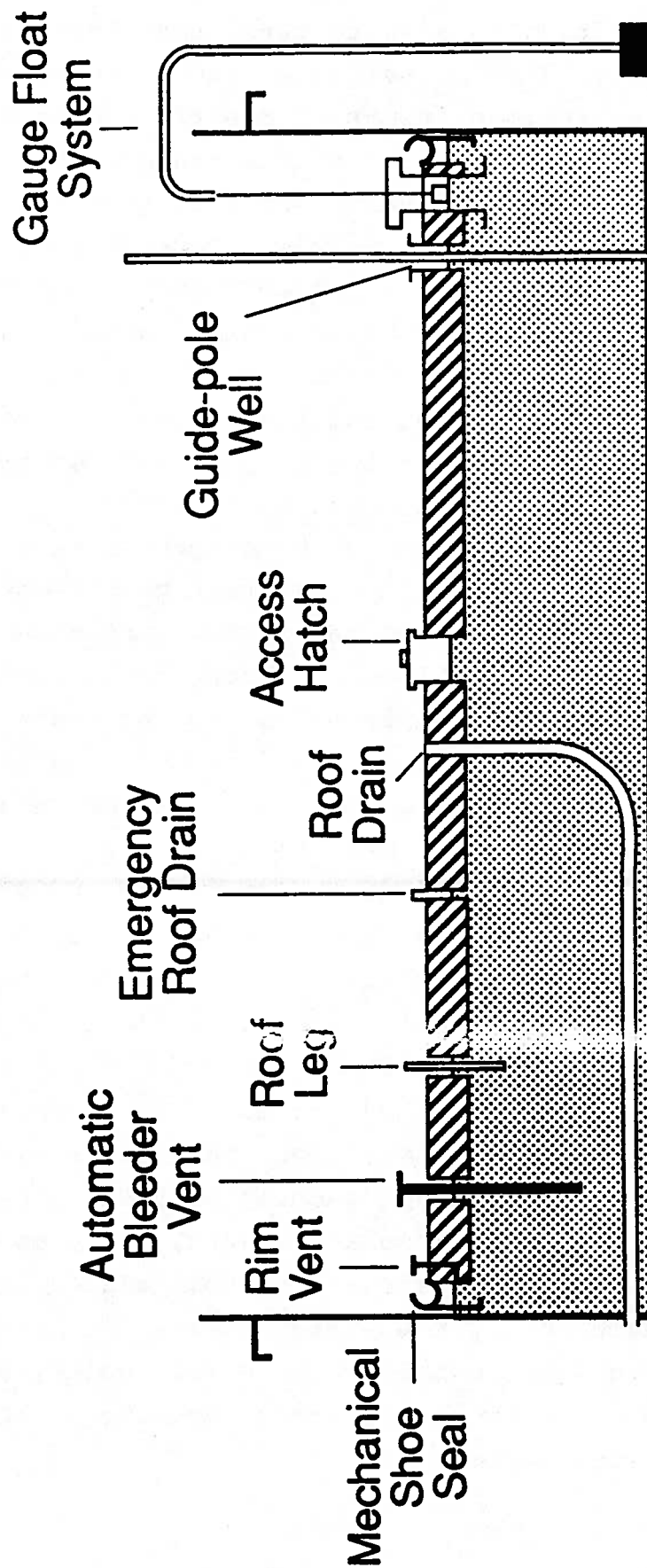


Figure 3-5. External Floating Roof

If retrofitted to a waste tank, the floating roof materials must be compatible with the waste, and floating roofs cannot be used in waste treatment tanks with surface mixers or aeration equipment. The emission reductions achieved by a floating roof relative to a fixed roof have been evaluated for volatile organic liquids by using empirical models. Depending on the type of deck and seal system selected, emission reduction of 93 to 97 percent can be obtained. For the smaller size tanks and varieties of wastes found at hazardous waste facilities, reductions of 74 to 82 percent can be obtained relative to a fixed roof. Converting an open top tank to a floating roof tank is estimated to reduce emissions by 96 to 99 percent.

Pressure tanks are designed to operate safely at internal pressures above atmospheric pressure. Consequently, these tanks can often be operated as closed systems and do not emit organics at normal storage conditions or during routine loading and withdrawal. Pressure-relief valves on the tanks open only in the event of improper operation or an emergency to relieve excess pressure. They are most common for the storage of gases; however, they can also be used to store liquids.

Another type of tank is that used for the distillation of organic liquids, which is common at solvent recyclers. In distillation, the more volatile components are separated from the waste by heating and transferring them to the vapor phase, which is removed through the overhead system. Distillation can be performed in a simple heated pot as a batch operation or in a column as a continuous operation. The device may be operated at atmospheric pressure, under vacuum, or under pressure. Emissions occur from the condenser/decanter vent, vents on collection tanks, and the vacuum system if vacuum is used (Figure 3-6).

In a batch still, the waste material is heated and volatiles are removed to some predetermined cutoff point, such as the concentration of organics in the condensate or the concentration remaining in the waste.

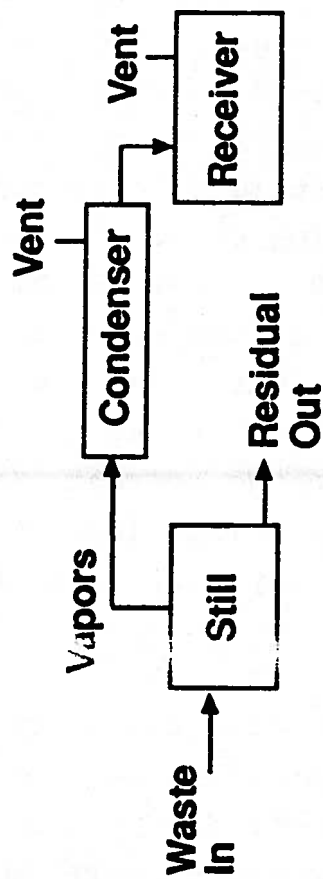


Figure 3-6. Emission Sources for Distillation

Emission models for distillation columns or other separation devices are not available because the emissions depend on the types of wastes, the specific organic compounds, and the design and operating details of the distillation and recovery equipment. However, the emissions from distillation and other separation devices are usually vented from a point source and can be measured. In addition, the operator should have the basic design and performance calculation that can provide insight into emission potential, or material balance calculations that indicate the fate of volatile compounds.

Solvent extraction is another type of separation process that has been used for organic liquids. It involves dissolving the volatile organics in a solvent. The solvent is physically separated from the water and then recovered for recycle by distilling off the volatiles. This process has also been demonstrated for removing benzene from petroleum refinery sludge.

Although 80 to 100 percent of the target organics can be removed from the waste by the solvent, the overall control efficiency is probably less. Major emission points associated with solvent extraction are those involved in the distillation process used to recover the solvent (Figure 3-7). As discussed earlier, these emission points include the vent on the condenser/decanter and any collection tanks associated with the unit.

3.1.1.2 Aqueous Wastes (Wastewater)

Wastewater collection systems are of interest because those that manage benzene containing wastes greater than or equal to 10 ppm are subject to the standard under §61.342(c)(1)(ii) are affected by the benzene waste operations NESHAP. Emissions occur when the wastewater is in direct contact with the air or from air sweeping through the collection system from a chimney effect. EPA modeling efforts indicate that 20 to 40 percent of the benzene that is present in the wastewater when it is first generated is emitted in the collection system.

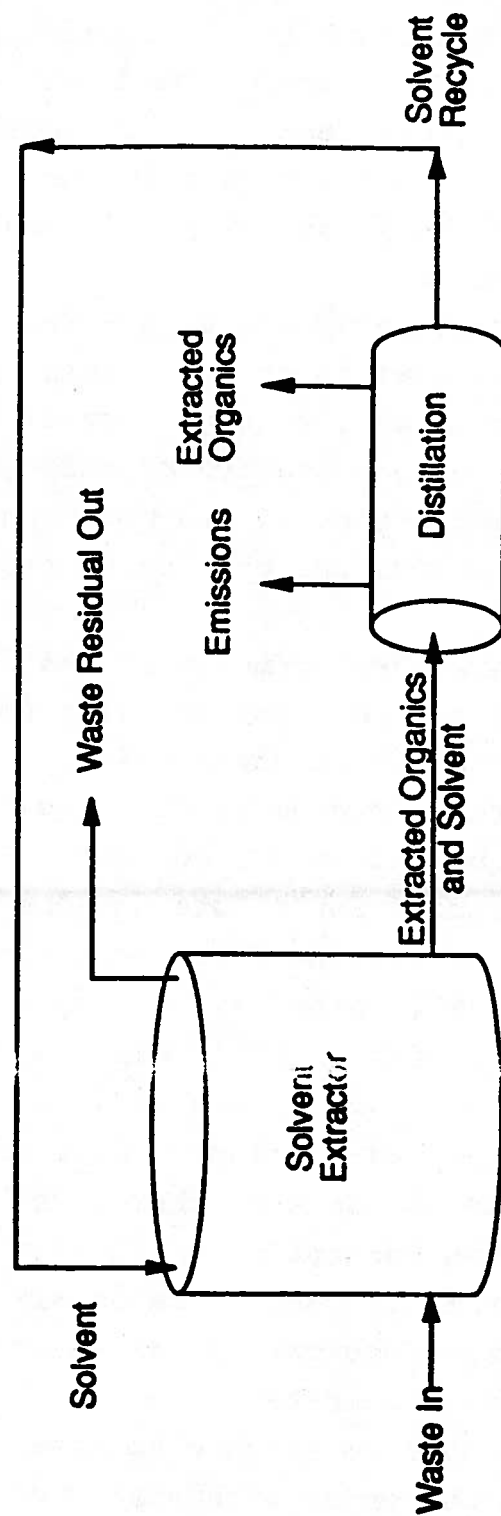


Figure 3-7. Emissions from Solvent Extraction

Wastewater is usually treated in large open tanks, and the emission mechanisms are similar to those described in the next section for surface impoundments. Generally, these tanks have smaller exposed surface areas and much shorter residence times than impoundments. This results in somewhat lower emissions from a single tank compared to a single impoundment; however, usually several of these tanks in series provide multiple opportunities for volatiles to be emitted.

Examples of wastewater treatment tanks include large open tanks used for equalization of wastewater streams from different processes and tanks that are often aerated or agitated to provide mixing, to suspend biomass, or to provide oxygen. Many wastewater treatment processes are performed in open tanks, such as equalization, neutralization, solids settling, and biodegradation.

Wastewaters are also commonly stored in fixed roof tanks. One error in using the API tank equation for aqueous waste is that an estimation of the concentration in the vapor from the mole fraction of the compound in the liquid can significantly underestimate the organic vapor concentration. Henry's law constant should be used for dilute aqueous wastes.

Another type of tank used to treat aqueous wastes is an air stripper (Figure 3-8), which may be a spray tower, packed column, or simply an aerated tank. It is most commonly used to remove parts per million or lower levels of volatiles from dilute aqueous wastes. Many air strippers with lower emissions simply are vented directly to the atmosphere, while others are controlled by carbon adsorption or incineration if organic concentrations warrant. Condensers on air strippers are generally ineffective because of low vapor phase concentrations and high volumetric flow rates.

Steam stripping also is used to treat aqueous wastes with concentrations on the order of hundreds of parts per million or higher. Steam is injected directly into the wastewater, the overhead vapors are condensed, organics are separated from the

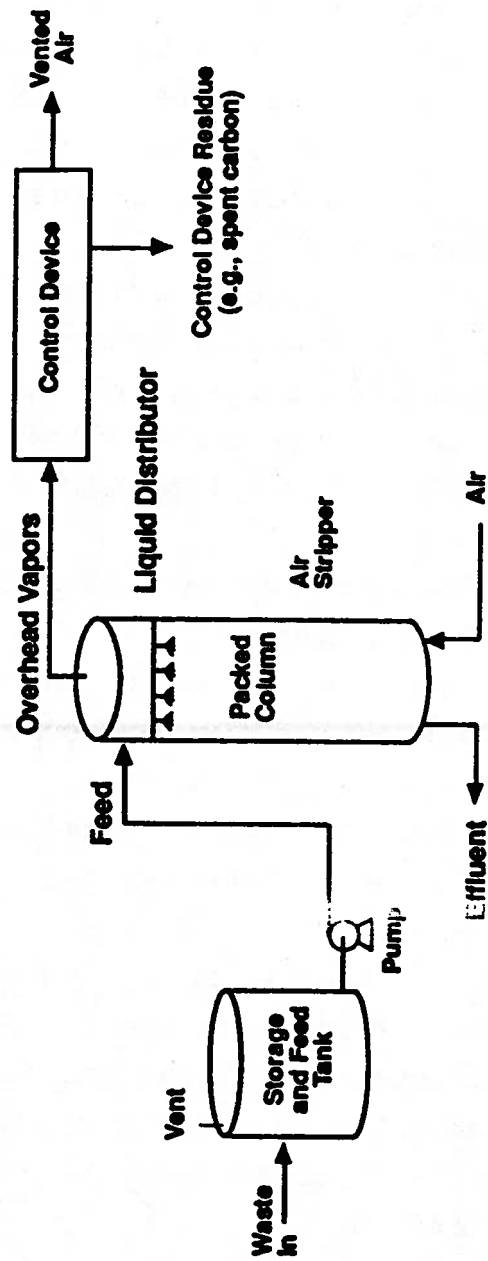


Figure 3-8. Schematic Diagram of an Air Stripping System

condensed water, and the decanted water is returned to the feed stream. Emissions occur from the vent on the condenser/decanter and from collection tank vents.

A schematic of an actual steam stripping system is shown in Figure 3-9 and illustrates the use of a heat exchanger to preheat the feed (to recover energy) and to cool the bottoms stream from the stripper before additional wastewater treatment. This particular system has a high level of organic recovery because both a primary and much colder secondary condenser are used. Emission control should be excellent because noncondensibles are vented to a vapor incinerator.

For continuous steam stripper, pretreatment (Figure 3-10) may sometimes be required to adjust pH or to remove solids, which can foul the column packing or trays and cause plugging problems. Any separate organic phase that can be decanted from the wastewater is removed prior to stripping.

3.1.1.3 Sludges

Fixation is another process that is often performed in tanks to solidify or stabilize sludges. The basic steps include mixing in a fixative agent, such as lime or fly ash, curing to allow solidification, and disposal. Mixing occurs most often in tanks, containers, or pug mills, which are relatively easy to enclose to control emissions. About half of the hazardous waste that is solidified is cured in tanks or containers, and the other half is cured in large open sources such as trenches or landfills. Most of the volatiles are emitted during mixing when agitation is provided while adding the fixative agent. Exothermic reactions produce heat and increase volatilization, as in the addition of quick lime or calcium oxide to aqueous sludges. These emissions can be controlled by installing covers or enclosures that are vented to a control device.

Another common process used for managing sludges is dewatering, which is performed by various types of filter presses, rotary vacuum filters, and centrifugal filters. A plate-and-frame press is an assembly of alternate solid plates,

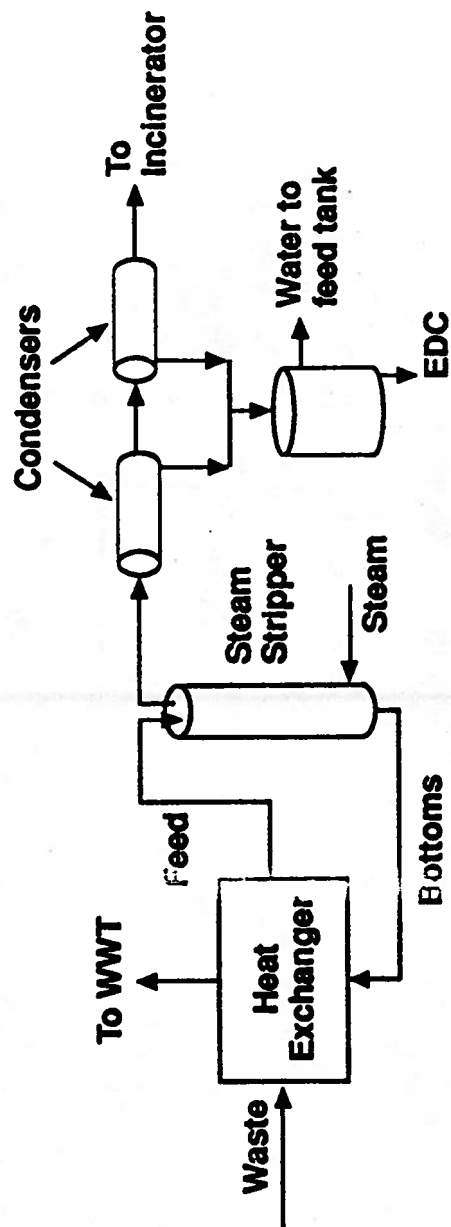


Figure 3-9. Steam Stripper for Ethylene Dichloride/Vinyl Chloride

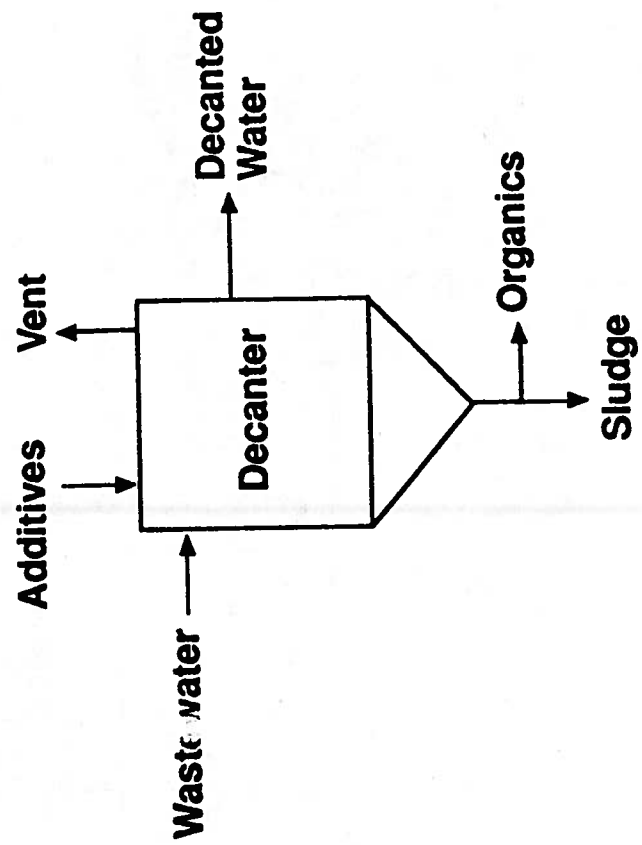


Figure 3-10. Preliminary Treatment Prior to Stripping

which are grooved or perforated to permit drainage, and hollow frames, in which the dewatered sludge collects during filtration. A filter medium, usually a fabric, covers both faces of each plate. As the slurry passes through the filter fabric to the plates, a cake of solids slowly builds up. The filtration continues until the pressure drop across the filter reaches a preset limit. The plates are then separated and the cake drops from the filter press into a collection bin under the press.

The belt filter press (Figure 3-11) squeezes the sludge between two systems of belts. Sludge is fed onto the lower belt, and, as the belt moves into the press, the upper belt meets it and squeezes the sludge. The filtrate squeezed from the sludge is usually collected in a sump under the filter and removed for further treatment or discharge. Solids are scraped off the belts as they separate and collect in a bin or are taken by conveyor to a storage or disposal area. As the belts continue their rotation, they are usually cleaned by being passed through a belt washing system of high-pressure spray nozzles.

Other types of dewatering units are rotary in nature and use a vacuum, gravity, or centrifugal force to remove water from the sludge. For larger scale operations, sludge is scraped from the unit continuously and discharged through a chute to a container or conveyor belt.

These dewatering devices are not usually enclosed systems and provide several opportunities for volatile organics to be emitted. For the plate-and-frame press, emissions occur when the press is opened to remove and transport the accumulated sludge. During filtration, a small amount of liquid may leak from the press and accumulate in the drip pan underneath. The belt press provides a moving exposed surface area that facilitates drying and evaporation of volatiles. The filtrate drains freely and is often collected in an open sump. Both the filtrate and sludge are sources of emissions. Similarly, the sludge and filtrate handling systems for rotary vacuum and centrifugal filters are emission sources for any volatiles that are present in the

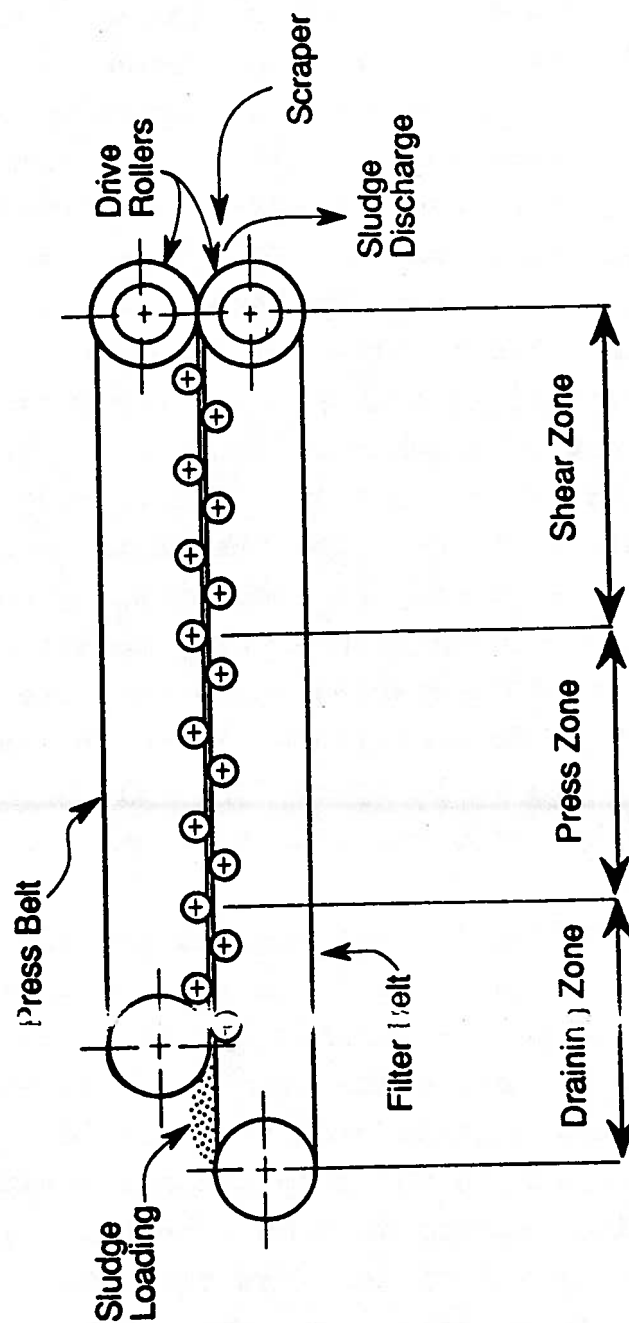


Figure 3-11. Belt Filter Press

original slurry. In addition, the vacuum pump may discharge volatiles. Emissions from dewatering devices can be controlled by building an enclosure around the unit and venting it to a control device.

Thin-film evaporators (TFEs) (Figure 3-12) are also used to treat sludges. The primary advantage of this treatment technique is that it can remove volatiles from viscous sludges and slurries. A thin layer of waste is spread over a moving or wiped surface that is heated to volatilize organics. Emissions occur from vents on condensers, decanters, and collection tanks, or from the vacuum system if one is used.

The vertical thin-film evaporator looks like a distillation column. In the TFE, the vapors with volatile organics are removed overhead to a condenser, and the treated waste is discharged from the bottom.

3.1.1.4 Ancillary Equipment

The ancillary equipment associated with tank systems includes pumps, valves, pressure-relief devices, compressors, sampling connections, and open-ended lines, which can become emission sources when they leak. Controls include dual mechanical seals with a barrier fluid (for pumps and compressors), sealless pumps, diaphragm or sealed-bellows valves, rupture disks for pressure-relief devices, closed-loop sampling, and caps for open-ended lines. In addition to the equipment controls for these types of sources, emissions can be controlled by establishing a leak detection and repair (LDAR) program. This program includes surveying these components for leaks, using a portable organic vapor detector to locate leaks, and making repairs, adjustments, or replacement as needed.

3.1.2 Surface Impoundments

A surface impoundment under Subpart FF means a waste management unit which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials), which is designed to hold an accumulation of liquid wastes or waste containing free liquids, and which is not an

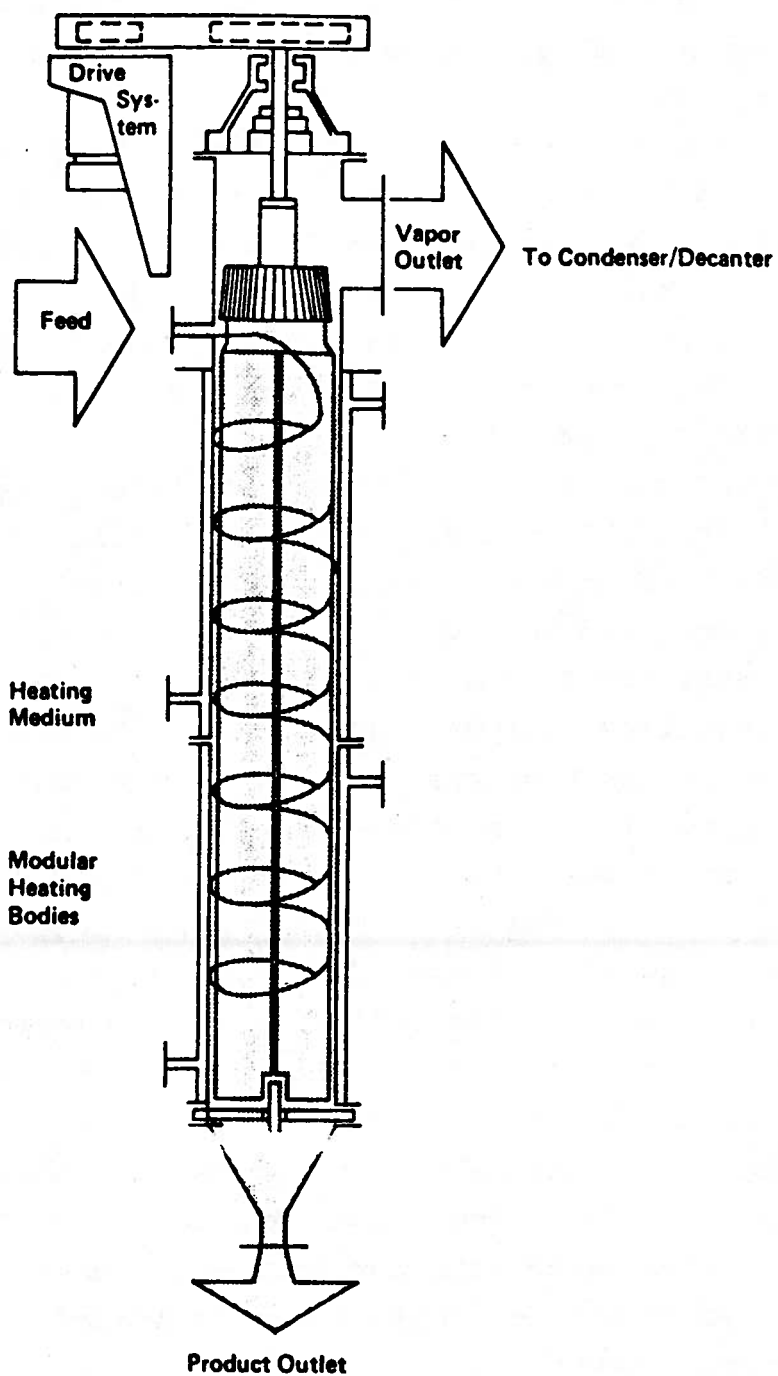


Figure 3-12. Flow Path of Thin-Film Evaporator

injection well. Examples of surface impoundments are holding, storage, settling, and aeration pits, ponds, and lagoons. Subpart FF regulates surface impoundments under §61.344.

Impoundments are simply ponds and lagoons that are used primarily for managing aqueous wastes and sludges. They are certainly land disposal sources, but they are discussed separately because of continued use after LDR is in place, and because they may continue to be major sources of air emissions. For example, surface impoundments that are dredged annually may be exempted from LDR.

A surface impoundment is below grade, usually has berms with sloping sides to contain wastes, and has a liquid surface that is exposed to the atmosphere. It may be operated as a flowthrough system with liquid flowing in at one point and out at the same time at another point, or the liquid may be pumped out or evaporated, leaving behind a sludge. Surface impoundments are commonly part of wastewater treatment processes and are used for storage, equalization of different waste streams, neutralization, biodegradation, or other processes.

Surface impoundments have a very high emission potential for volatile organics, such as benzene, for several reasons. Several of the factors that affect emissions from impoundments are listed in Table 3-1. These same factors are applicable to emissions from open tanks.

Table 3-1. Major Factors Affecting Emissions

- **Constituent volatility**
- **Residence time**
- **Surface area**
- **Turbulence (aeration, agitation)**
- **Windspeed and temperature**
- **Extent of competing mechanisms (such as biodegradation)**

The constituent's volatility has a direct effect on emissions from impoundments and other sources with exposed liquid surfaces. Highly volatile compounds such as benzene are readily

emitted from open sources, whereas relatively nonvolatile compounds such as phenol tend to stay in the water.

The residence time in the impoundment has an obvious effect on emissions: longer residence times result in higher emissions. If the waste is in the impoundment long enough, even relatively nonvolatile compounds are evaporated. For impoundments with relatively short residence times, a higher percentage of the organic may be removed with the effluent and emitted later in other units in the treatment sequence. In addition, the residence time of the waste in the impoundment is typically on the order of days, weeks, or months, which results in the loss of most of the volatiles. These impoundments have large exposed surface areas that range in size up to several acres.

Many impoundments and tanks are agitated for mixing, air stripping, or biodegradation. Agitation and aeration increase emissions by creating turbulent zones and increase contact between the waste and air. A highly turbulent area and water spray around the agitators used in mechanically aerated units exists. Essentially all of the highly volatile compounds can be emitted when the impoundment is mechanically agitated. Approximately half of the impoundments used (in 1986) to treat hazardous waste were aerated or agitated.

As is illustrated in Figure 3-13, emissions from impoundments occur from wind blowing across the exposed surface of the waste. Organics can also be removed by biodegradation, adsorption onto sludge, or removed with the effluent. Emission models have been developed to estimate the extent of each of these different removal mechanisms. In the EPA's Air Emission Models report, EPA 450/3-87-026, emission correlations were evaluated for sensitivity to input parameters. The effect of ambient temperature on VOC/benzene emissions from surface impoundments and open tanks has been found to be less critical than other parameters such as wind speed and retention time.

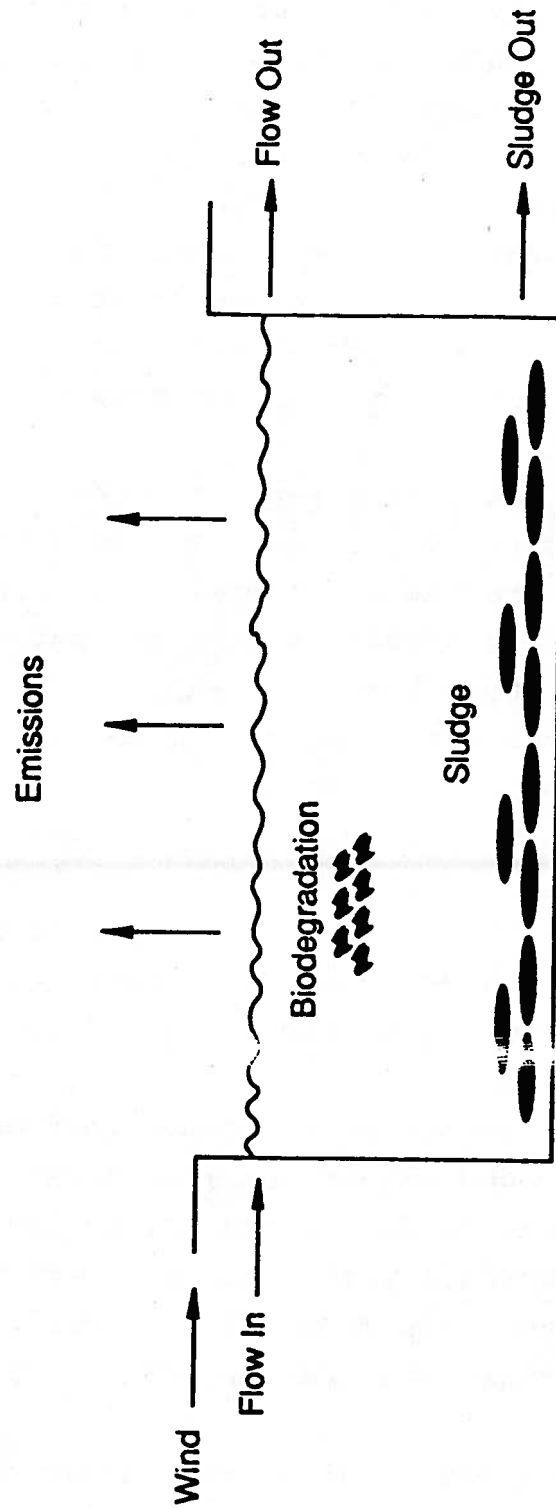


Figure 3-13. Fate of Organics: Emission, Effluent, Biodegradation, Sludge

The models developed for open liquid surfaces are applicable to both impoundments and open tanks. These models can account for relatively calm surfaces or the emissions from the turbulence created by aeration or agitation. The emissions are modeled as two mass transfer steps in series: (1) diffusion through the liquid, and (2) mass transfer from the surface of the liquid to the air. The approach can account for removal in flowthrough systems and removal in units designed for disposal or evaporation. The extent of biodegradation, if any, can also be estimated by the models (Hazardous Waste Treatment, Storage, and Disposal Facilities - Air Emission Models, EPA 450/3-87-026, July, 1990).

One of the controls demonstrated for impoundments is an air-supported structure, which uses fans to maintain a positive pressure to inflate the structure. For effective control, the air vented from the structure must be sent to a control device, such as a carbon adsorber. Air-supported structures have been used as enclosures for conveyors, open top tanks, and storage piles, as well as impoundments.

An air-supported structure and control device has been installed on a 1-acre aerated lagoon that is used for biodegradation at a pharmaceutical manufacturing facility. The cover material is a PVC-coated polyester with a Tedlar backing. Agitators are used inside the structure to provide oxygen and to keep carbon and biomass suspended. In this application, the exhaust from the structure is vented to a carbon adsorber. Very few leaks were found around the structure; consequently, the control efficiency is determined primarily by how well the control device works. This plant's experience with the air-supported structure has found that corrosion can be accelerated inside the structure and that special worker safety precautions are needed.

Floating membrane covers are another control option and have been demonstrated on various types of impoundments, including water reservoirs in the western parts of the United States. For

proper operation as a control technique for organic compounds, the membrane must provide a seal at the edge of the impoundment and provisions made to remove rain water. If gas is generated under the cover, vents and a control device may be needed. In addition, if sludge accumulates, some means for periodic sludge removal may be required, such as a sludge pump.

Emission control depends primarily on the type of membrane, its thickness, and the individual organic compounds in the waste. Theoretical estimates based on diffusion through the membrane indicate worst-case control efficiencies of 50 to over 95 percent. Laboratory studies indicate that the cover is an efficient control for some organic compounds; however, for specific compounds that permeate the membrane, the control efficiency is lower.

The floating membrane cover has been demonstrated on an impoundment that is used as an anaerobic digester. The impoundment is about 7 acres in size with a depth of approximately 14 feet. The membrane material is 100-mil high-density polyethylene. The cover is anchored over a concrete ring wall that extends above grade level around the perimeter of the impoundment. The membrane extends over the concrete wall and is covered with backfill to anchor and seal it. Punctures or tears in the membrane can be patched. This installation has been in operation for 5 years, and the company supplying the membrane offered a 20-year warranty on the life of the material.

It should be noted that most facilities subject to Subpart FF are replacing surface impoundments with tanks in order to efficiently comply with the LDR and other regulations.

3.1.3 Containers

Containers are defined as any portable waste management unit in which a material is stored, transported, treated, or otherwise handled. Examples of typical containers are drums, barrels, tank trucks, barges, dumpsters, tank cars, dump trucks, and ships. Emissions occur from loading these containers, from uncovered containers during storage or transport, and from spills. Subpart FF regulates containers under §61.345.

Drums can be sources of emissions from the evaporation of leaks and spills, and poor housekeeping practices can make spill detection and cleanup difficult. If the drums are well maintained on a diked pad, emissions from spills or ruptures can be identified by routine inspection procedures and promptly cleaned up. Dumpsters or roll-off bins can be a source of emissions if they are left uncovered with the surface of the waste exposed to the atmosphere.

Emissions from containers (Figure 3-14) occur when they are loaded, and emissions are greatest when splash filling is used. When splash filling, the vapors displaced from the container by loading can quickly become saturated with volatiles from the splashing. Submerged fill uses an influent pipe that is below the surface, which reduces splashing and the degree of saturation of the displaced vapors. A study of submerged filling of tank trucks indicated that emissions were reduced by 65 percent relative to splash filling. Other basic controls for containers include using simple covers during storage or transport and routine housekeeping practices with daily inspections and prompt cleanup of spills.

3.1.4 Individual Drain Systems

The collection system includes individual drains, sewers, and junction boxes. Subpart FF regulates individual drain systems under §61.346. Some of the different ways that the wastewater is drained from a specific process into the sewer line are shown in Figure 3-15. The open, unsealed drain is the greatest source of emissions from the free fall of the wastewater and vapors from the sewer. The closed drain essentially eliminates these emissions.

Individual sewer lines from different processes flow through junction boxes before entering the trunk or main sewer lines that handle combined flows from different process areas. The purpose of the junction box is to combine flows, to permit ready access to the sewer line for cleaning and inspection, and to isolate vapors from the different individual sewer lines. A typical

Splash Loading (tends to saturate vapors)

Submerged Loading

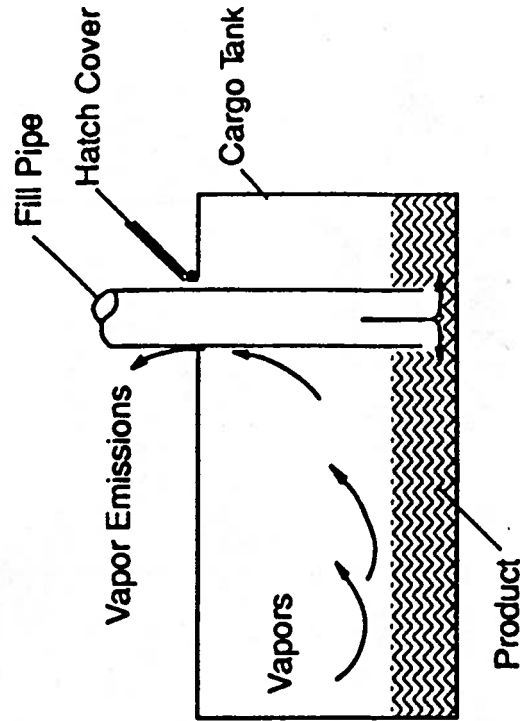
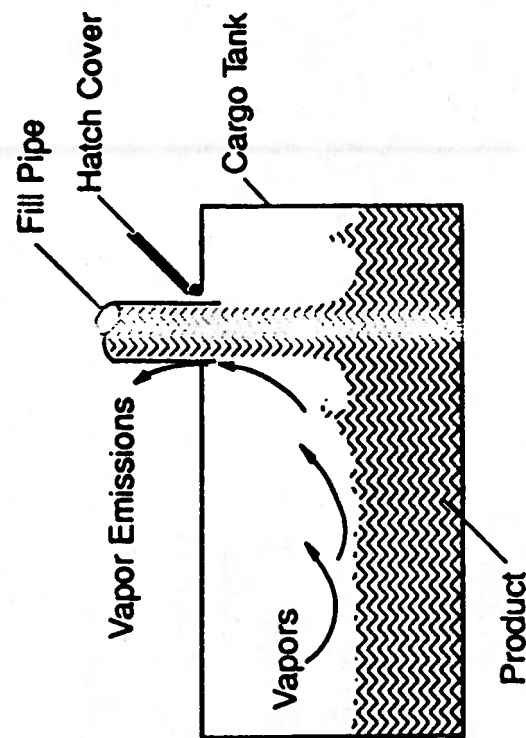


Figure 3-14. Splash Loading vs. Submerged Loading

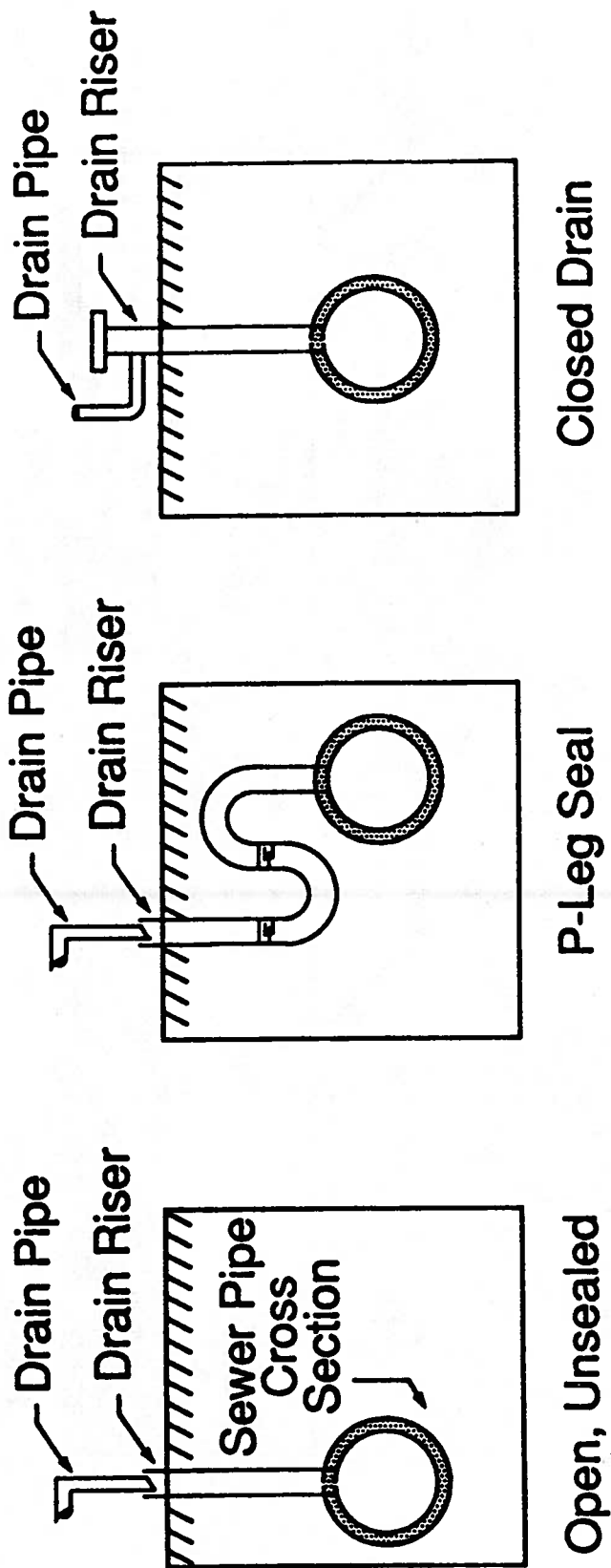


Figure 3-15. Individual Drains

junction box that is fitted with a gas-tight cover and a vent is shown in Figure 3-16. The device also has a water seal to prevent the flow of air through lines that may be partially filled with water. This device is operated at a constant liquid level; consequently, emissions from working losses should be relatively low.

3.1.5 Oil-water separators

Oil-water separators at petroleum refineries are also part of collection systems that may require control under NESHAP. Subpart FF regulates oil-water separators under §61.347 and alternative standards for oil-water separators under §61.352. These devices separate oil, water, and sludge from the wastewater (Figure 3-17). The most common type of oil-water separator at petroleum refineries is the API separator. The separator is a large rectangular tank with an oil skimmer and the main bay, which provides a zone for separation. The separator relies on the different densities of oil, water, and solids; oil and solids lighter than water float on top of the aqueous phase and heavier sludges sink to the bottom. Oil is skimmed from the surface, and heavy sludge is periodically removed from the bottom of the separator.

Another type of separator in use at refineries is the corrugated-plate interceptor (CPI). This unit consists of 12 to 48 parallel corrugated plates mounted at an angle. Wastewater flows downward between the plates with the lighter oil droplets coalescing and floating to the surface. The oil droplets move up the plate to form a floating layer that is skimmed from the surface of the tank. These oil-water separators can be controlled by covering or by covering and venting to a control device.

3.1.6 Land Disposal Sources

Landfills, wastepiles, and land treatment are the sources expected to be most directly affected by the LDR. These are open area sources from which the volatile organic compounds are emitted fairly quickly; the emissions can be controlled by covers

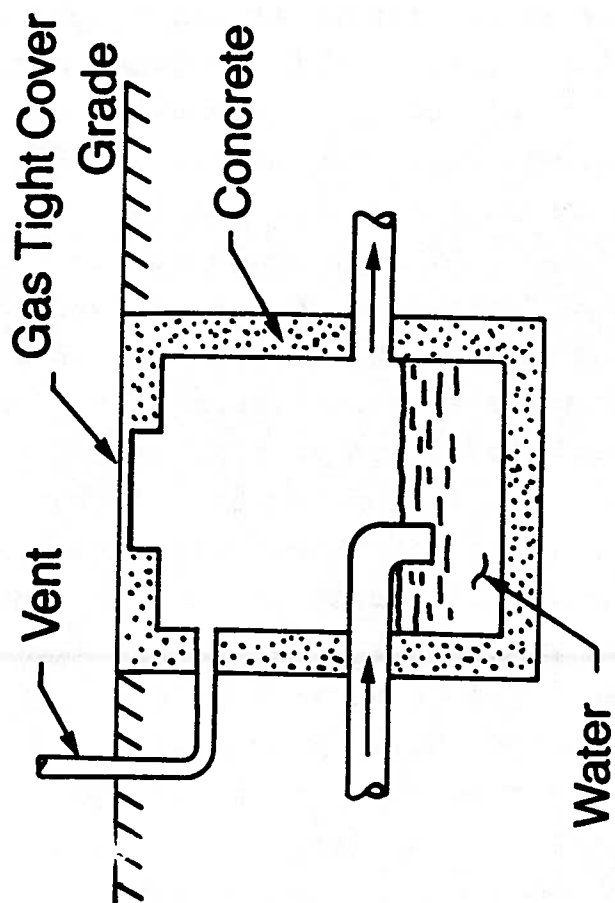


Figure 3-16. Typical Junction Box

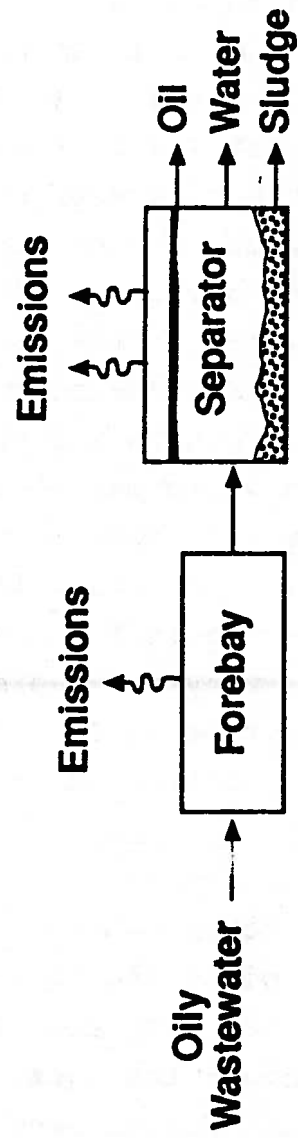


Figure 3-17. Oil-Water Separator

and enclosures. However, the technologies described under LDR will likely take care of the benzene in the waste, and in the end they should not be significant sources of emissions.

A land treatment facility is defined as a facility at which waste is applied onto or incorporated into the soil surface; such facilities are disposal facilities if the waste will remain after closure. Land treatment is also known as land farming, land application, land spreading, and soil incorporation. Volatiles are rapidly emitted from the surface of land-treated waste (Figure 3-18). Over time, volatiles diffuse through the waste to the surface, where they are swept away by the wind.

In land treatment, the waste can be applied to the soil and mixed by tilling, or the waste may be sprayed directly onto the soil and subsequently mixed with the soil by tilling. Volatiles are rapidly removed from the waste during spraying.

Landfills are composed of active and covered cells. Wastes are often segregated based on waste compatibility and compaction requirements. The wastes are then covered with a layer of soil and compacted, and another layer of waste is added or a new cell is started. If any volatiles are left in the waste when it finally reached the landfill, they are rapidly emitted from the surface of exposed waste in active cells. After covering and compacting, emissions occur by diffusion, barometric pumping, and gas venting (Figure 3-19).

Wastepiles are defined as noncontainerized accumulations of solid, nonflowing waste used for treatment or storage. The emission mechanisms for wastepiles are similar to those for land treatment: rapid volatilization from the exposed surface followed by mass transfer through the waste.

Models have been developed for exposed soil surfaces such as land treatment and wastepiles and for covered landfills. In the model for exposed soil surfaces that contain organics, volatiles in the oil and water are assumed to be in equilibrium with air in the void spaces. Some organics may be adsorbed onto the soil particles, and, in some cases, biodegradation may destroy the

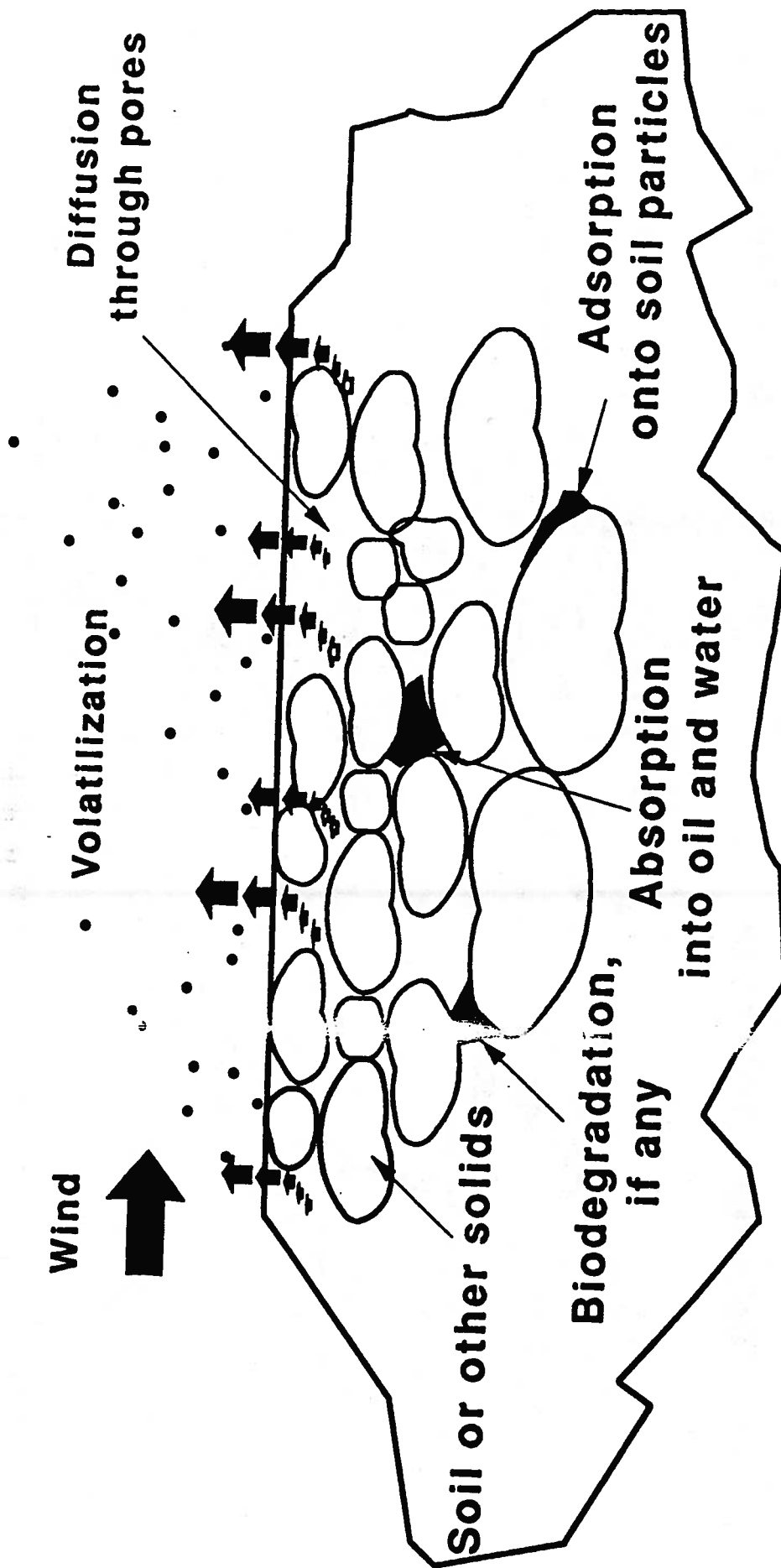


Figure 3 18. Land Treatment Emission Mechanisms

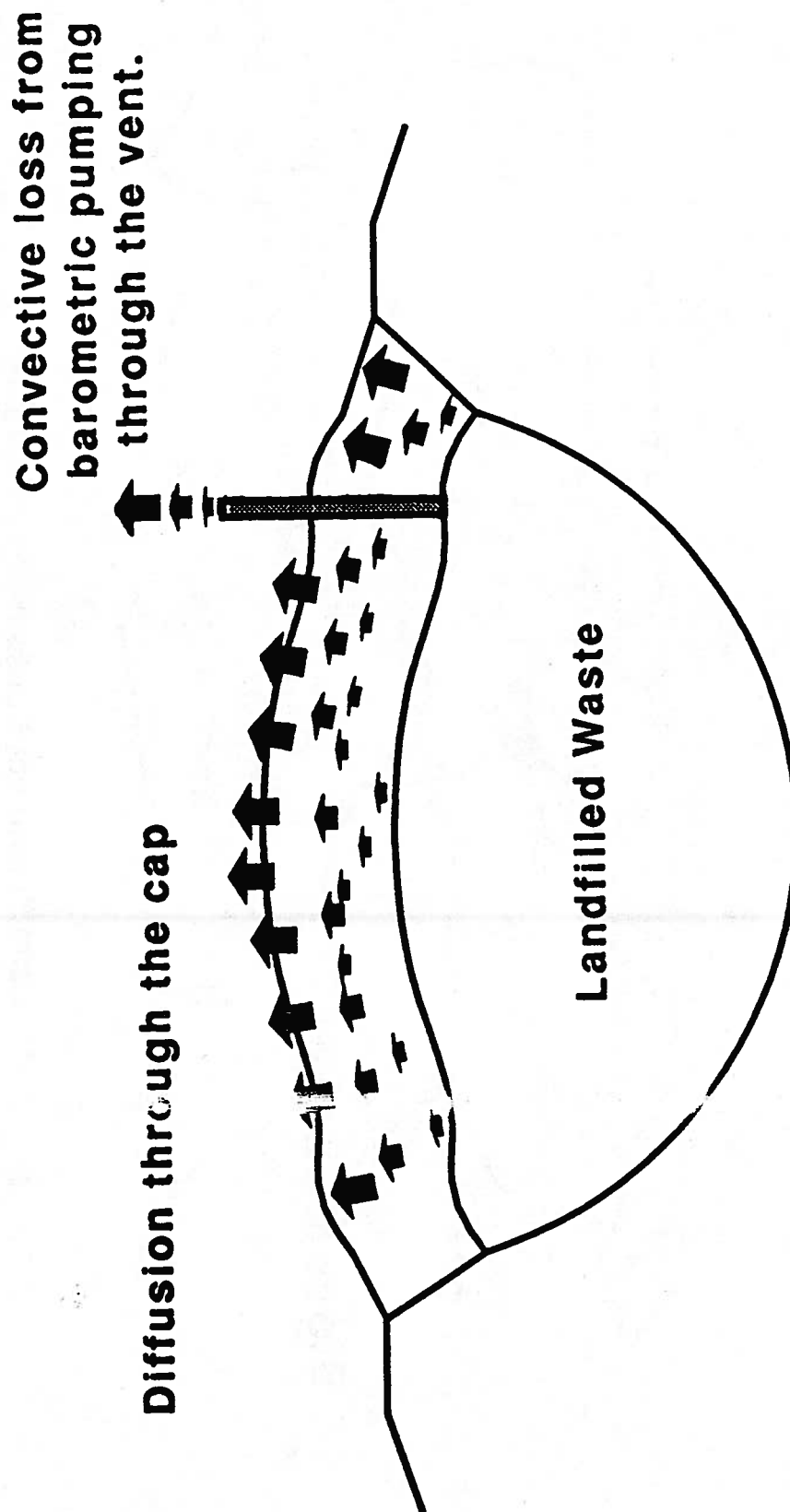


Figure 3-19. Emissions From a Closed Landfill

organics. Emissions occur by diffusion to the surface, where organics are removed by the wind. For the covered portion of landfills, the modeling includes diffusion through the cap and losses from barometric pumping, which is caused by changes in ambient pressure.

These land disposal sources can be controlled by installing a flexible membrane cover, enclosing the source in a rigid structure, or using an air-supported structure as discussed earlier for surface impoundments. A better emission control is not to place waste containing volatiles in these sources (for example, treat the wastes to remove the organics before disposal).

3.2 Emission Controls

Several air pollution control devices can be applied to many of the sources that have been discussed in this document once they are covered or enclosed and vented. The traditional control technologies that are discussed briefly here are carbon adsorption, condensation, absorption, and vapor combustion.

3.2.1 Carbon Adsorption

In adsorption, organics are selectively collected on the surface of a porous solid. Activated carbon is a common adsorbent because of its high internal surface area: 1 gram of carbon can have a surface area equal to that of a football field and can typically adsorb up to half its weight in organics. The adsorber will remove essentially all of the target volatiles from the vented vapors until breakthrough, which is when the volatiles are first detected in the cleaned vapor leaving the bed. Carbon adsorbers can achieve control efficiencies of at least 95 percent, and control levels of 97 to 99 percent have been demonstrated in many applications. The two common types of adsorbers are carbon non-regenerable (e.g., canisters) and regenerable (e.g., fixed beds).

Carbon canisters (Figure 3-20) are used for low vent flows, usually less than 100 ft³/min, and are not regenerated onsite. They are usually discarded or returned to the supplier. The canisters are fairly compact units and can easily be removed and fresh canisters installed. Fixed-bed carbon adsorbers that can be regenerated (Figure 3-21) are used for controlling continuous vent streams with flows exceeding 100,000 ft³/min and can handle a wide range of organic concentrations. A common procedure is to have dual beds with one desorbing while the other is adsorbing.

The carbon capacity for organics is affected by the concentration of organics in the vapor. Carbon manufacturers generally have equilibrium data for specific compounds and their specific carbons. The bed design is important and must be deep enough to prevent rapid breakthrough, yet not so deep as to cause excessive pressure drop. The flow rate is important in the bed design and in determining carbon capacity requirements. Humidity has an adverse effect because water occupies some of the adsorption sites. For a relative humidity of 50 percent or more, dehumidification or dilution may be necessary to lower the relative humidity. The bed's operating temperature affects capacity, and some compounds such as aldehydes and ketones may generate heat in adsorbers. For these special cases, some means of removing the excess heat may be necessary.

For effective emission control by adsorption, one of two actions is necessary: either to monitor for breakthrough or to replace the carbon periodically before breakthrough occurs. In addition, any emissions from the disposal or regeneration of the carbon should be controlled. Controlling emissions from a vent stream is of little value if the collected organics are emitted later from the desorption condenser vent or in the wastewater treatment associated with regeneration.

- For vent flows less than 100 CFM
- Cannot be regenerated in canister

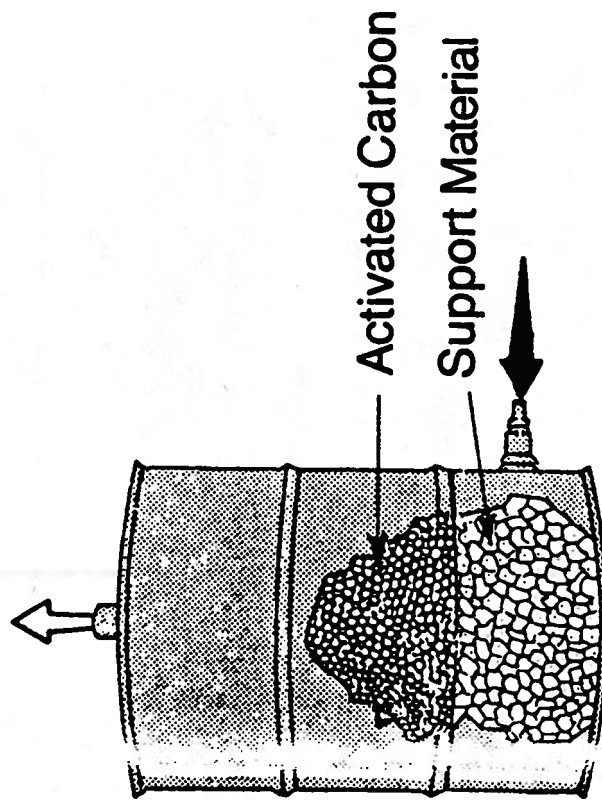


Figure 3-20. Carbon Canisters

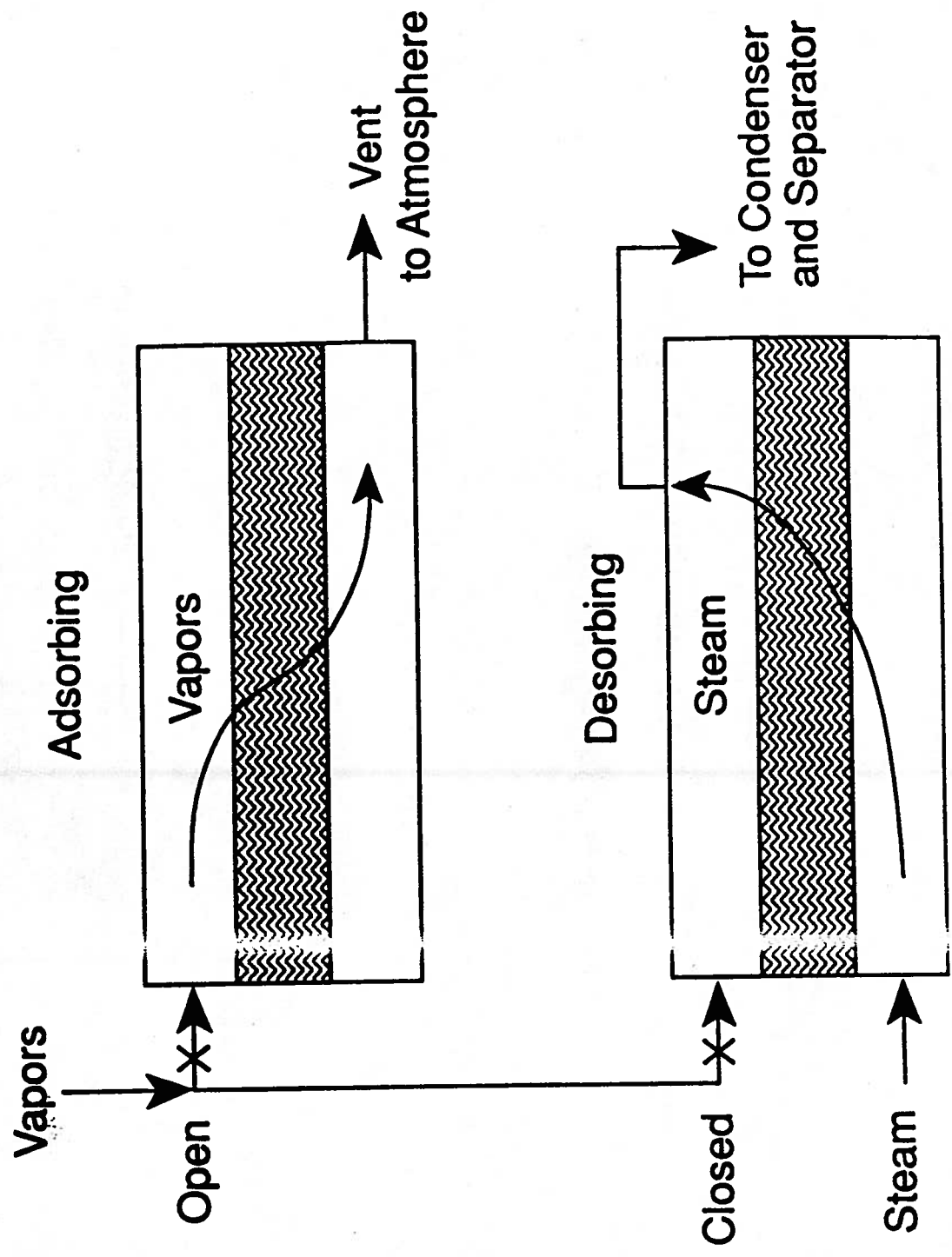


Figure 3-21. Two-Stage Adsorption System

3.2.2 Condensation

Condensers work by cooling the vented vapors to the dew point and removing the organics as a liquid. The efficiency of a condenser is determined by the vapor phase concentration of the specific organics and the condenser temperature. Two common types of condensers are contact condensers and surface condensers.

The contact condenser (Figure 3-22) is cheap and efficient. However, the cooling liquid that directly contacts the vented vapors can present a disposal problem. For example, if the coolant is waste that is sent to wastewater treatment, the volatiles may be emitted in open tanks. The shell and tube condenser (Figure 3-23) does not allow contact between the vented vapors and the cooling medium. In this type of condenser, a concentrated organic liquid can be recovered for recycle or other use.

3.2.3 Absorption

In absorption, the organics in the vent gas are dissolved in a liquid (Figure 3-24). The contact between the absorbing liquid and the vent gas is accomplished in spray towers, scrubbers, or packed or plate columns. Some common solvents that may be useful for volatile organics include water, mineral oils, or other nonvolatile petroleum oils. Absorption efficiencies of 60 to 96 percent have been reported for organics. For example, methylene chloride removal from vented vapors has been measured at 37 percent using water as the absorbing liquid.

The material removed from the absorber may present a disposal or separation problem. For example, organics must be removed from the water or nonvolatile oil without losing them as emissions during the solvent recovery or treatment process.

3.2.4 Vapor combustion

Vapor combustion is another control technique for vented vapors. The destruction of organics can be accomplished in flares, thermal oxidizers, such as incinerators, boilers, or process heaters, or in catalytic oxidizers.

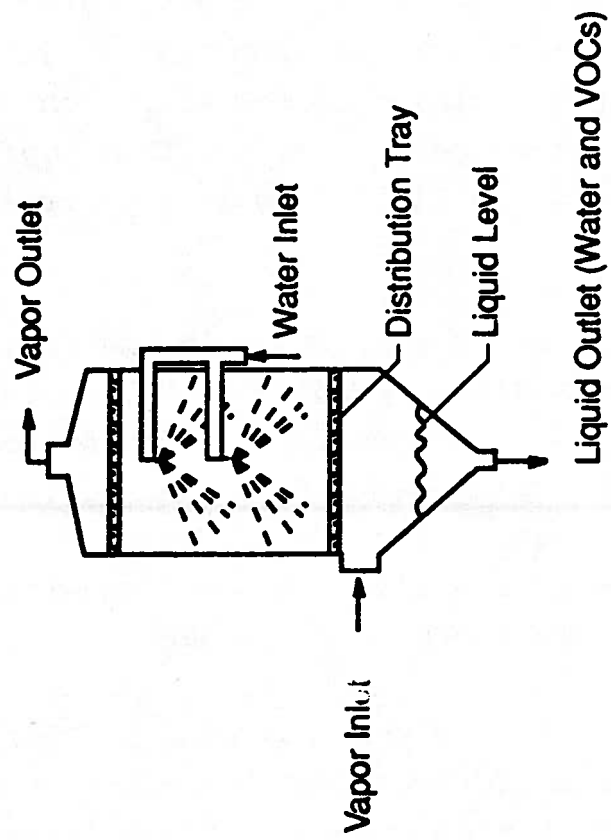


Figure 3-22. Schematic Diagram of a Contact Condenser

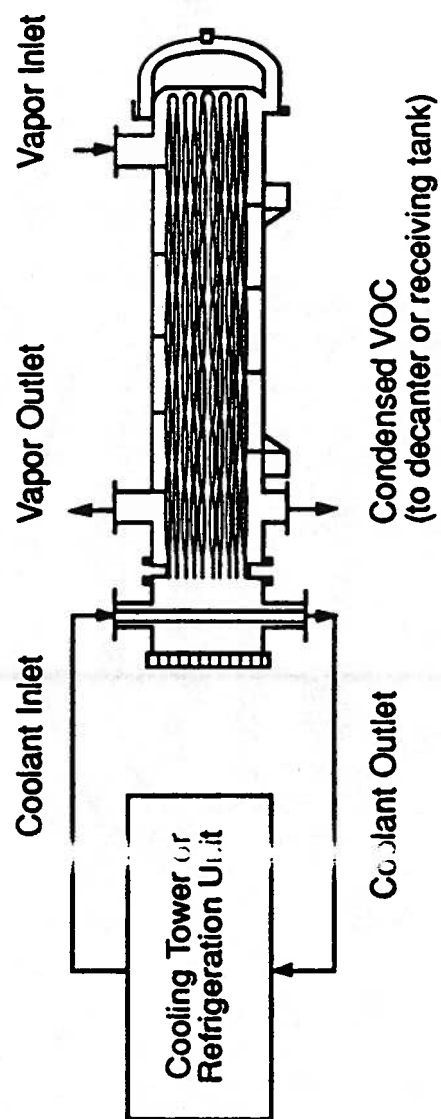


Figure 3-23. Schematic Diagram of a Shell-And-Tube Surface Condenser

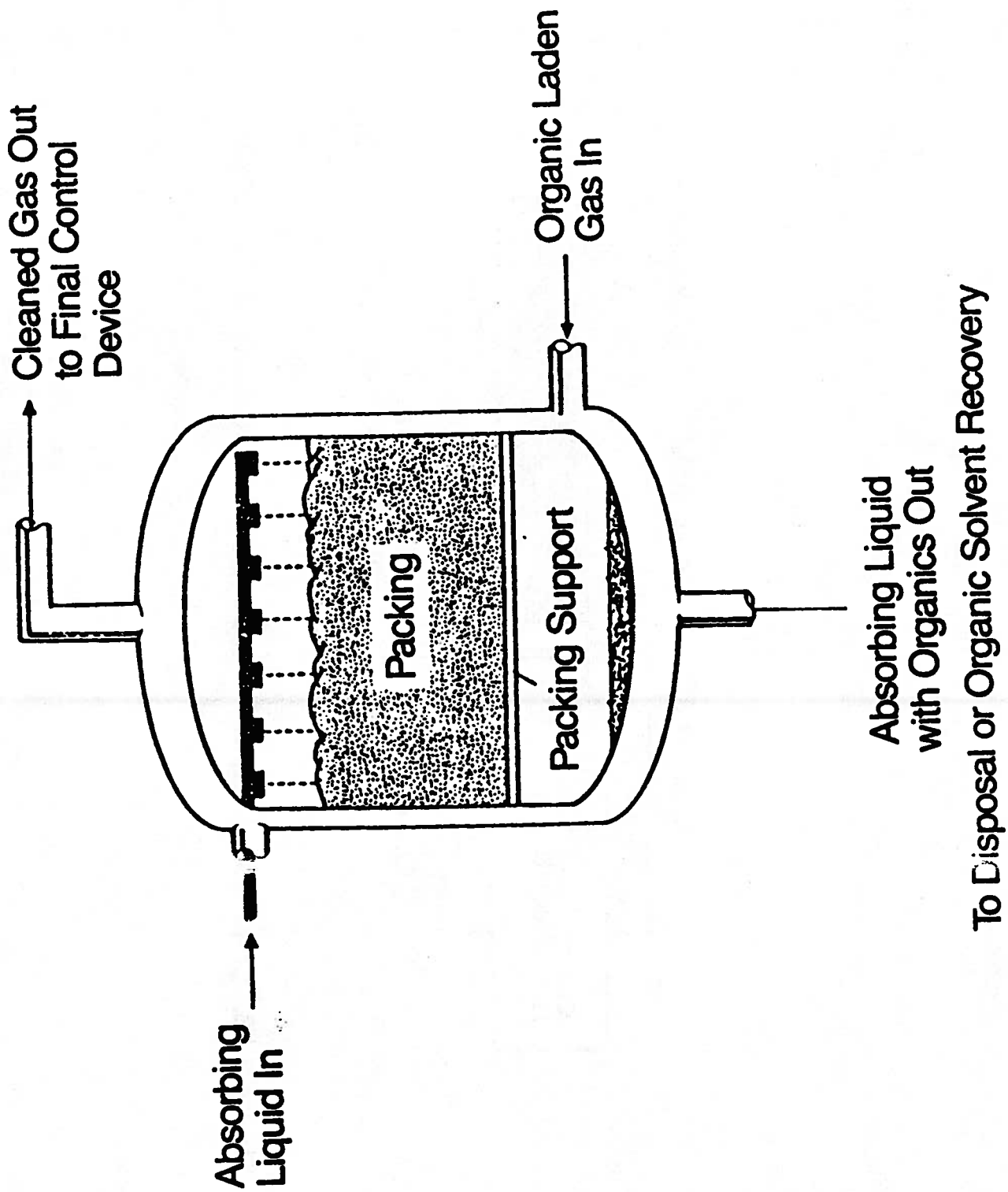


Figure 3-24. Packed Tower for Gas Absorption

Flares are an open combustion process in which the oxygen is supplied by the air surrounding the flame. Flares are operated either at ground level (usually with enclosed multiple burner heads) or they are elevated. Elevated flares often use steam injection to improve combustion by increasing mixing or turbulence and pulling in additional combustion air. Properly operated flares can achieve destruction efficiencies of at least 98 percent. Figure 3-25 is a schematic of the basic components of a flare system. The EPA has developed regulations for the design and operation of flares that include tip exit velocities for different types of flares and different gas stream heating values (40 CFR 60, §60.18(a)).

Thermal vapor incinerators can also achieve destruction efficiencies of at least 98 percent if the conditions of an adequate residence time are met. These vapor incinerators can be designed to handle vent rates of 200 to 500,000 cfm. An auxiliary fuel may be required to maintain the combustion conditions if the vent gas has less than 50 Btu/scf. Figure 3-26 shows the components of a vapor incinerator. A heat recovery unit, such as a steam generator, may be used to recover some of the energy from a thermal incinerator.

Catalytic incinerators provide oxidation at temperatures lower than those required by thermal incinerators. Design considerations are important because the catalyst may be adversely affected by high temperatures, high concentrations of organics, fouling from particulate matter or polymers, and deactivation by halogens or certain metals. The basic components of a catalytic oxidizer (Figure 3-27) are similar to those of a thermal unit except that a catalyst bed is used. The energy requirements of a catalytic oxidizer are lower than those of a thermal unit because of the lower operating temperatures.

The organics in vented vapors can also be destroyed with a high level of efficiency in boilers or process heaters. In these devices, vapors with halogens or sulfur are avoided because of potential corrosion problems. These devices recover the heating

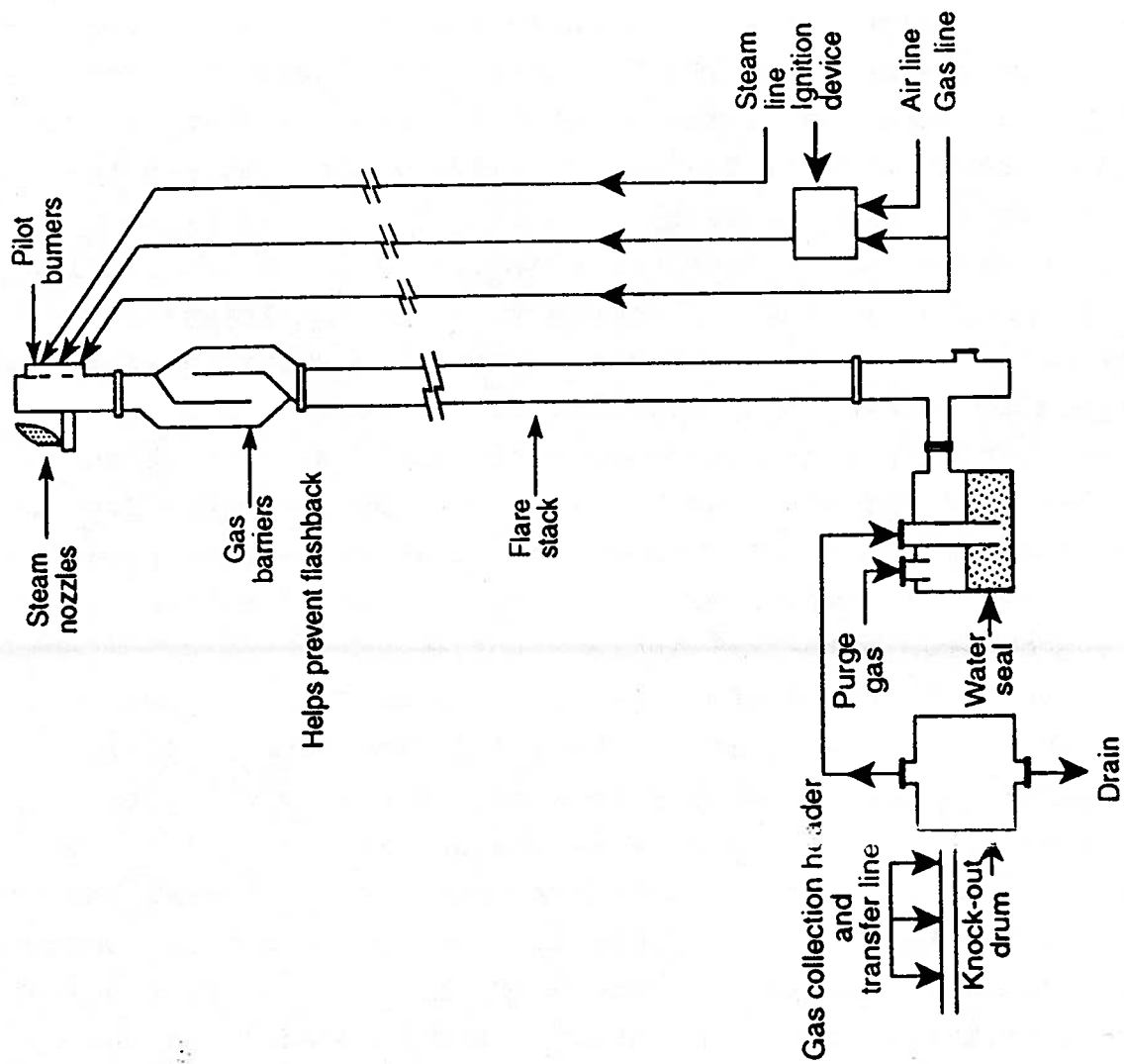


Figure 3-25. Schematic of the Basic Components of a Steam-Assisted Elevated Flare System

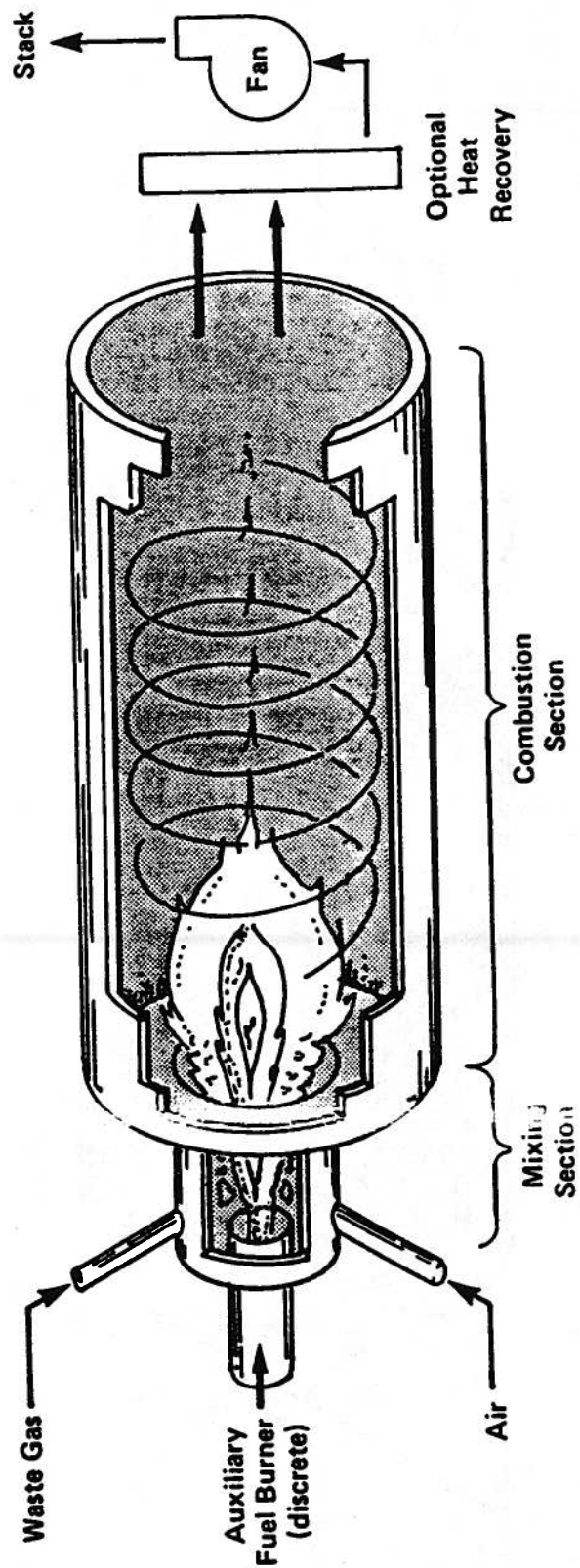


Figure 3-26. Thermal Incinerator

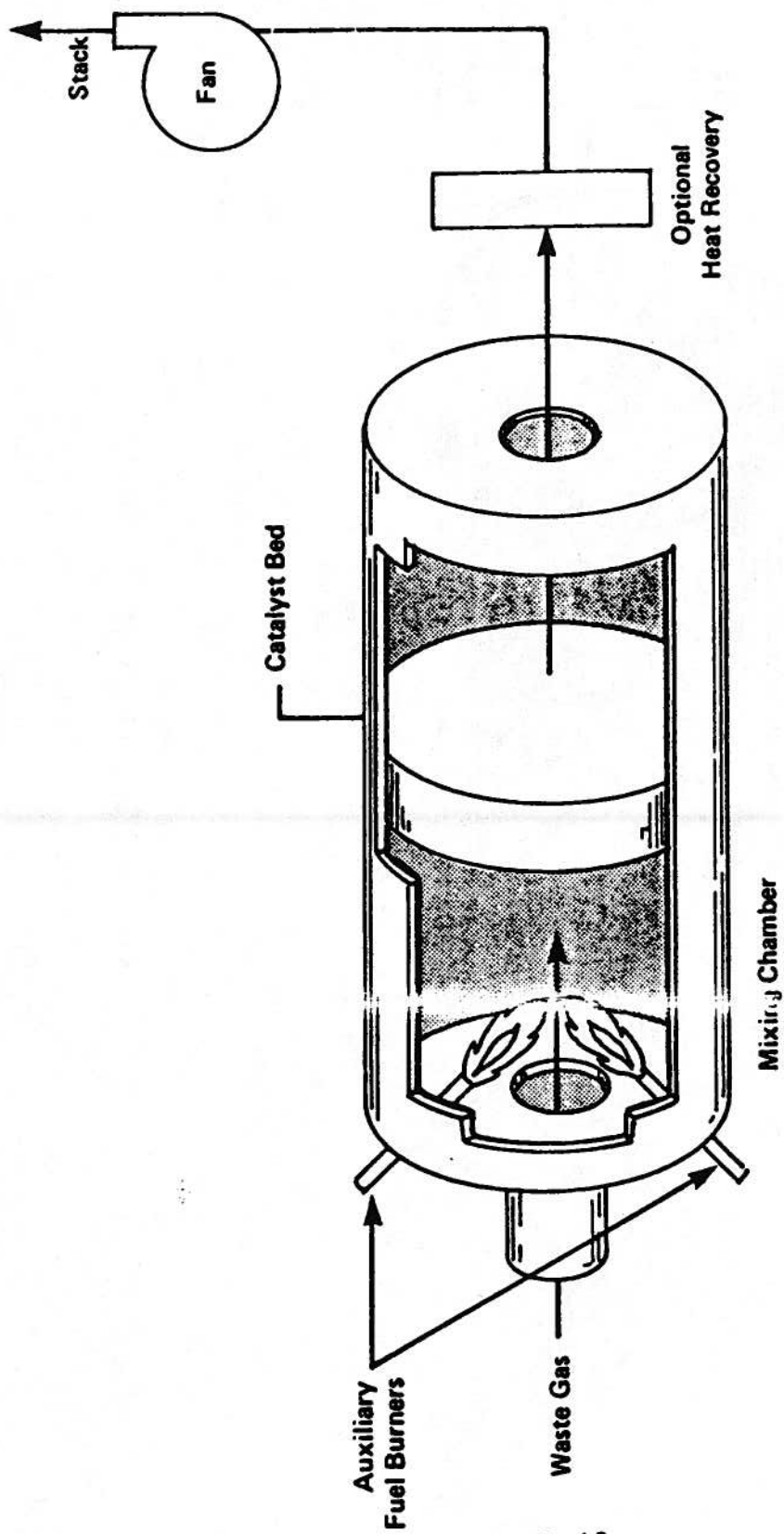


Figure 3-27. Catalytic Oxidizer

value of the vent stream, and they offer the advantage of using existing equipment to control emissions.

3.2.5 Organic removal

Organic removal or pretreatment is a control option that is applicable to a variety of waste types. These processes include steam or air stripping, thin-film evaporation, solvent extraction, and distillation. These processes are capable of removing essentially all of the highly volatile compounds from the waste. The removal of the volatiles near the point of generation can avoid the need to install controls on subsequent process units and may facilitate recycling the recovered organics back to the process.

The control efficiency that can be obtained by organic removal depends on many factors, such as the percent removed from the waste, the emissions from the removal system, and the uncontrolled emissions from treatment units before the removal device was installed. Generally, overall control efficiencies of 98 to 99 percent can be achieved.

3.2.6 Waste incineration

Waste incineration is also an emission control option that can be used instead of processing the waste in units with a high emission potential. This technology has been identified as an alternative to land disposal in the development of the land disposal restrictions for certain wastes. Destruction efficiencies of 99.99 percent or higher have been demonstrated in properly operated waste incinerators.

3.3 Summary

Based on work performed in the development of the NESHAP, wastewater systems are a major source of benzene emissions from wastes that contain benzene. Emissions occur from the surface of open area sources, and high percentages of the volatiles are lost as emissions in these sources. For enclosed sources, the displacement of vapor containing volatiles from the enclosed vapor space is the emission mechanism. For both types of

sources, heating or aeration increases emissions. Emissions also occur from the evaporation of leaks and spills.

Emission models have been developed for open area sources, including both the liquid surface of impoundments and tanks and the solid surfaces associated with land treatment and landfills. Both types of models can account for the biodegradation of specific compounds, and the effect of turbulence from agitation can be included for liquid surfaces. For enclosed sources, models are available to estimate the vapor displacement rate and the concentration of volatiles in the vapor.

For emission control, open area sources and containers can be covered or enclosed. Control devices can be installed to collect and remove organics from vented vapors, which is especially important if the sources are heated or aerated. Organic removal by pretreatment and waste incineration are also emission control options, and their use may preclude the need to apply covers or control devices to subsequent treatment units. Simple work practices, such as leak detection and repair or inspections and cleanup of spills, help to control emissions from equipment leaks and spills. Pumps and valves that are designed not to leak offer another potential control option for these sources.

4.0 INSPECTION PROCEDURES AND CHECKLISTS

The following inspection checklists provide guidelines for conducting an inspection of affected facilities for compliance with the benzene waste operations NESHAP. The scope is limited to visual and recordkeeping evaluation of regulated items, i.e., no source testing or other measurements are required of the inspector to assess compliance. Although not addressed in this document, discussion of emission measurement techniques and the associated monitoring equipment may be found in "Benzene Equipment Leak Inspection Manual" (Reference EPA 340/1-90-001). The visual inspection procedures focus on the assessment of regulated equipment using key inspection points or visible criteria while following the necessary safety guidelines. The recordkeeping inspection procedures focus on the evaluation of operating conditions and assessment of facility monitoring, routine owner/operator inspection and recordkeeping requirements.

The checklist items are organized by equipment item. This format prevents duplication of information and ensures that items are not overlooked, thereby saving time and eliminating backtracking. Suggested procedural steps for evaluating specific equipment are given to walk the inspector through the inspection. Space is provided for a summary of findings, observations, and apparent violation. Concise, complete documentation of inspection results is necessary and should be made at the inspection site. Inspectors should be aware that a new OSHA confined space entry regulation became effective on April 15, 1993. This regulation can be found at 29 CFR 1910.146. The regulation defines confined spaces and requires permits be issued and certain safety measures followed.

Record inspection checks are presented after the visual inspection procedures. They are intended to augment information obtained during the visual inspection. In some cases when health and safety considerations preclude use of visual inspection techniques, facility records will be the only source of compliance documentation available.

In preparation for the upcoming inspection, the inspector should review the facility's file including all applicable permits. It should be noted that the 1990 Amendments to the Clean Air Act (1990 Amendments) substantially changed the requirements for State operating permit programs. Title V of the 1990 Amendments is a comprehensive program that will require all States to issue operating permits similar to those issued for wastewater dischargers under the Federal National Pollution Discharge Elimination System (NPDES) program. The scope of Title V requirements includes the submission of applications, due in November 1995, for renewable operating permits. These applications must demonstrate compliance with all applicable requirements of the 1990 Amendments including PSD/NSR, SIP's, Federal implementation plans, NSPS, maximum achievable control technology (MACT) NESHAP's for air toxics, and acid rain regulations. The purpose of the operating permits program is not only to ensure compliance with all applicable requirements of the 1990 Amendments but to enhance EPA's ability to enforce the rules that will improve the Act's overall effectiveness.

The following equipment will be necessary for a full inspection:

- Non-sparking flashlight
- Camera
- Respirator(s)
- SCBA
- Hard hat
- Safety shoes
- Calculator
- Copy of Regulation
- Binoculars
- Extra batteries and film for camera
- Photo log
- Dowels to measure gaps
- Employee identification/credentials
- Facility map - if available

**INSPECTION CHECKLIST FOR
WASTE OPERATIONS**

1. Name of corporation, company, or individual owner:

2. Mailing Address:

3. Facility Address:

4. Source Number (permit number, date of permit, permit expiration, etc.):

5. Name and Title of Contact:

6. Telephone Number:

7. Date of Inspection, Time of Day, Weather Conditions:

13. Sketch of Facility:

14. Followup activities:

8. Name and Title of Government Official Conducting Inspection:

9. Pre-inspection interview:

10. Post-inspection interview:

11. Additional comments:

12. Photo log:

**INSPECTION CHECKLIST FOR
FIXED ROOF STORAGE VESSELS WITH A CLOSED VENT SYSTEM [§61.343]
AND CONTROL DEVICE**

Equipment	Visual Inspection Procedures	Field Observations
1. Fixed Roof	<p>Visually determine that the tank is a fixed roof tank.</p> <p>Inspect the periphery of the tank for possible leaks in the shell, valves, flanges and pumps. Note any liquid accumulations from tank appurtenances or evidence of corrosion especially on the tank shell or roof.</p> <p>What is the tank's maximum organic vapor pressure? What is the tank's normal organic vapor pressure? Is there a pressure gauge on the tank for continuous readout?</p> <p>What are the maximum and minimum flow-weighted annual average water contents of the streams managed in the tank?</p> <p>What is the design capacity of the tanks? What is the actual volume held in the tank?</p> <p>What is the withdrawal/filling schedule for the tank? When was the tank last emptied and refilled?</p> <p>Which standard for tanks has the facility elected to comply with? [§61.343 or §61.351]</p>	
2. Closed Vent System	<p>Is there a closed vent system associated with the fixed roof tank?</p> <p>Visually inspect the closed vent system from the ground and platform if accessible. Note visible gaps, holes or corrosion spots seen in the ductwork of the closed vent system.</p>	

**INSPECTION CHECKLIST FOR
FIXED ROOF STORAGE VESSELS WITH A CLOSED VENT SYSTEM [§61.343]
AND CONTROL DEVICE**

Equipment	Visual Inspection Procedures	Field Observations
3. Control Device	<p>Is there a control device connected to the closed vent system?</p> <p>What type of control device is used?</p> <p>Is the control device operational? How was information determined?</p> <p>Check piping valves and fittings for visible leaks. How was information determined?</p> <p>What type of continuous monitoring device is used? Is the device operational? What parameter is the device monitoring? Note level monitored and compare with design levels from facility reports during record inspection.</p>	

**INSPECTION CHECKLIST FOR
EXTERNAL FLOATING ROOF STORAGE VESSELS [§61.351(b) and
§60.1112b(a)(2)]**

Equipment	Visual Inspection Procedures	Field Observations
1. External Floating Roof (EFR)	<p>The inspector should not perform the inspection while on the EFR if the roof is below four feet of the top of the tank or if the inspector is not equipped with the proper respiratory protection. An adequate inspection can be performed with a combination of a record inspection and a visual inspection performed from the platform with the aid of visually enhancing devices (binoculars).</p> <p>Using the level of the EFR and the current volume stored in the tank, determine that the EFR is resting on the liquid surface. While wearing proper respiratory protection, pull back the primary seal to observe the level of the benzene.</p> <p>Visually inspect the condition of the external floating roof. Note the condition (corrosion free, small pits in surface, pools of standing liquid, visible corrosion spots etc.). [40 CFR §60.112b(a)(2)]</p>	
*Note: See page 4-12 for diagram		
2. Closure Device	Determine that a closure device (seal) is between the wall of the storage vessel and the roof edge. This can be performed for the secondary seal by visual inspection from the platform.	
a. Primary Seal	<p>While wearing proper respiratory protection, visually inspect the primary seal for cracks, gaps or tears by pulling back the secondary seal. Otherwise the inspection must be done by consulting facility records.</p> <p>Determine that the seal is either a metallic shoe seal or a liquid-mounted seal (in contact with the liquid). Check that the seal is continuous around the tank.</p>	

**INSPECTION CHECKLIST FOR
EXTERNAL FLOATING ROOF STORAGE VESSELS [§61.351(b) and
§60.1112b(a)(2)]**

Equipment	Visual Inspection Procedures	Field Observations
	Determine that the gaps between the wall and seal do not exceed 212 cm ² per meter (10.0 in ² per foot) of vessel diameter and the gap widths do not exceed 3.81 cm (1.5 in.). This can be done by measuring the gaps in the seals with dowels of various diameters, while using proper respiratory protection, or by consulting facility records. Measurements should be recorded for at least four locations along the tank.	
i. Metallic Shoe	For metallic shoe seals, check that there is a flexible coated fabric that spans the space between the metal shoe and the vessel wall. Determine that one end of the metallic shoe seal extends into the stored liquid and the other extends a minimum vertical distance of 61 cm (24 inches) above the liquid surface. This can be done by using a hooked probe or by consulting the facility design records that indicate the metallic shoe seal dimensions.	
ii. Liquid-Mounted	Identify any corrosion, holes, tears or other openings in the shoe, flexible seal fabric, or seal envelope. If the secondary seal is pulled back, observe that the seal is in contact with the liquid between the wall of the storage vessel and the EFR. Otherwise, use facility records to determine that the seal was in contact with the liquid between the wall of the storage vessel and the EFR the last time the facility inspected it.	

**INSPECTION CHECKLIST FOR
EXTERNAL FLOATING ROOF STORAGE VESSELS [§61.351(b) and
§60.1112b(a)(2)]**

Equipment	Visual Inspection Procedures	Field Observations
b. Secondary Seal	<p>Observe from the platform that the seal is continuous and completely covers the space between the EFR and the vessel wall. Note on the tank roof drawing, provided with this checklist, where any gaps, tears, holes, or corrosion points are seen.</p> <p>Determine from facility records that a secondary seal is installed above the primary seal or if the secondary seal is pulled back, observe that there is a primary seal below the secondary seal.</p> <p>Determine that the gaps between the wall and seal do not exceed 21.2 cm² per meter (1.0 in² per foot) of vessel diameter and the gap widths do not exceed 1.27 cm (0.5 in.). This can be done by measuring the gaps in the seals with dowels of various diameters while wearing proper respiratory protection or by consulting facility records. Measurements should be recorded for at least four locations around the tank.</p> <p>Look for any corrosion, holes, tears, or other openings in the shoe, flexible seal fabric, or seal envelope.</p>	
3. Automatic Bleeder Vents	<p>Observe from the platform that the vents are closed during normal operations (exemptions for emptying or refilling).</p> <p>If possible, observe a tank filling operation. While floating the roof off the leg supports, observe whether the automatic bleeder vents open. (Vents may be open only when the roof is being floated off the tank bottom during filling or when the roof is supported on the legs during draining operation.)</p>	

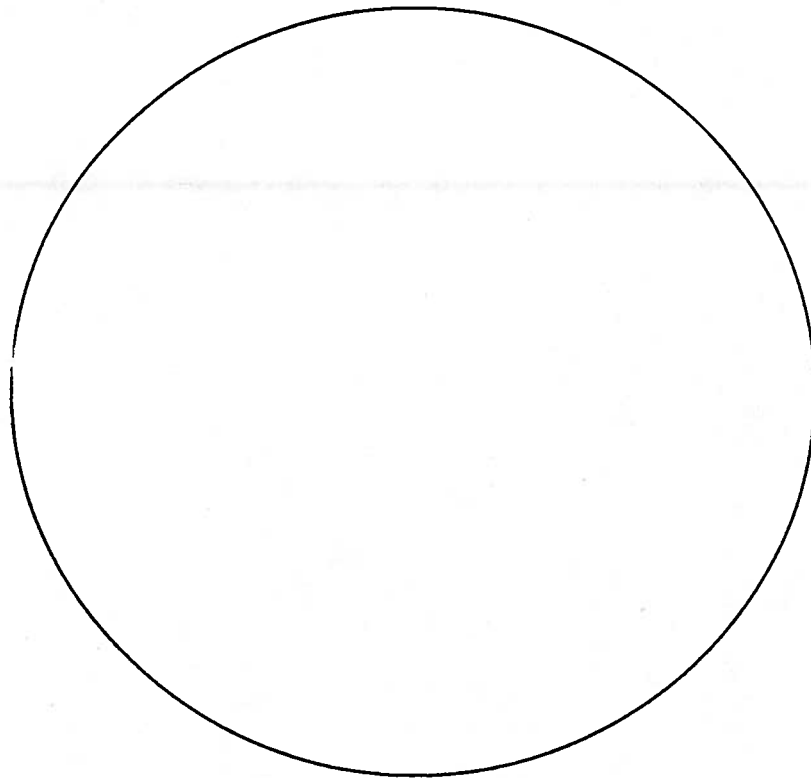
**INSPECTION CHECKLIST FOR
EXTERNAL FLOATING ROOF STORAGE VESSELS [§61.351(b) and
§60.1112b(a)(2)]**

Equipment	Visual Inspection Procedures	Field Observations
4. Rim Space Vents	<p>Visually determine if the rim space vents are closed during normal operation (exceptions during emptying or refilling).</p> <p>If possible, observe whether the rim space vents are open when the roof is being floated off the leg supports. (Rim space vents may be open only when the roof is being floated off or landing on the roof leg supports during filling or draining operations).</p>	
5. Emergency Roof Drain	<p>Observe from the platform if the emergency roof drain is covered with a slotted membrane fabric. Does the fabric cover at least 90 percent of the opening? Were actual measurements or visual estimations used for this determination?</p>	
6. Deck Openings	<p>Confirm by visual inspection that each opening in the external floating roof deck is equipped with a gasketed cover, seal or lid. Without opening the lid or cover, visually inspect the visible portion of any seal or gaskets. Does the seal or gasket appear worn, torn, shredded, ripped, or otherwise misaligned to prevent forming a vapor-tight seal?</p> <p>Are all deck openings closed? (The only exception is when the device is in actual use.)</p>	

TANK FLOATING ROOF DRAWING

Show defects using symbols. Show seal gaps and lengths.

N



LEGEND:

Equipment:

○	..... Gauge well
T	..... Leg stand
⊗	..... Roof drain
★	..... Emergency roof drain
∞	..... Vacuum breaker
↑	..... Vent
|||||	..... Platform & ladder

Defects:

⊖	..... Leg top
≠	..... Leg pin
∪	..... Open hatch
∨	..... Tom seal
| -P- |	..... Primary seal gap
| -S- |	..... Secondary seal gap

**INSPECTION CHECKLIST FOR
INTERNAL FLOATING ROOF STORAGE VESSELS [§ 61.351(a)(1) and
§60.112b(a)(1)]**

Equipment	Visual Inspection Procedures	Field Observations
1. Internal Floating Roof (IFR)	<p>The inspector should be advised of the hazards of inspecting an internal floating roof tank that contains benzene. The inspector should never enter the tank to inspect the IFR without first consulting the EPA document "Confined Space Safety Document for Conducting NESHAP Compliance Inspections of Benzene Storage Tanks (EPA 455/R-92-003)." An inspector should never go into a confined space without another inspector who has also been trained to enter confined spaces.</p> <p>Confirm that the IFR is floating on the liquid surface (except when empty or during initial fill) by comparing the liquid level with the roof level. The operator can supply this information.</p> <p>Inspect the periphery of the tank for possible leaks in the shell, valves, flanges and pumps.</p> <p>Inspect the periphery of the tank for corrosion.</p>	

**INSPECTION CHECKLIST FOR
INTERNAL FLOATING ROOF STORAGE VESSELS [§ 61.351(a)(1) and
§60.112b(a)(1)]**

Equipment	Visual Inspection Procedures	Field Observations
2. Deck Openings	<p>While using proper respiratory protection, observe without entering the IFR, if all sample well penetrations into the IFR have a slit fabric cover. Is 90 percent of the opening covered? Were actual measurements or visual estimates used for this determination?</p> <p>Visually verify if the ladder passage through the deck has a gasketed sliding cover. Is the cover closed? Does it seal without any visible gaps?</p> <p>Visually inspect the fixed roof column. Is there a flexible fabric sleeve or a gasketed sliding cover provided on the deck at the point of column entrance? Is the fabric sleeve free from holes, tears or gaps?</p> <p>Does the gasketed cover seal without any visible gaps?</p>	
3. Closure device	<p>Visually determine that a continuous closure device is installed to fill the gap between the edge of the IFR and the vessel wall. Look for signs of seal deterioration. The seals can be observed through roof hatches with the use of a non-sparking flashlight. This should not be attempted if the inspector is not using a self-contained air supply before opening the roof hatch.</p> <p>Is the closure device either a foam or liquid seal, two seals or a metallic shoe seal?</p> <p>Identify any corrosion, holes, tears or other openings in the shoe, flexible seal fabric, or seal envelope. Indicate their positions and measurements on the tank floating roof drawing provided with this checklist.</p>	

**INSPECTION CHECKLIST FOR
INTERNAL FLOATING ROOF STORAGE VESSELS [§ 61.351(a)(1) and
§60.112b(a)(1)]**

Equipment	Visual Inspection Procedures	Field Observations
4. Automatic Bleeder Vents	Are the vents closed? (Exceptions allowed during emptying and refilling procedures only.) Are vents gasketed?	
5. Rim Space Vents	Are the vents closed? (Exceptions allowed during emptying and refilling procedures or at other times when set at the manufacturers recommended setting to release pressure buildup.) Are vents gasketed? Are gaskets in good condition?	
6. Covers and Lids	While using a proper self-contained breathing apparatus, determine visually that each opening in the IFR is closed and equipped with a cover or lid. (Exceptions for leg sleeves, automatic bleeder vents, rim space vents, column supports, ladder passages, sampling wells, and stub drains must meet their respective closure requirements.) There should be no visible gaps. While using a proper self-contained breathing apparatus, visually determine through hatch that all opening in the IFR are closed (except when a device is in actual use). Are covers on access hatch and automatic gauge float well closed and bolted unless in use?	

INSPECTION CHECKLIST FOR CONTAINERS [§61.345]

Equipment	Visual Inspection Procedures	Field Observations
1. General	<p>Do the containers exhibit any signs of corrosion?</p> <p>Is there a pressure gauge? What is the pressure reading?</p>	
2. Cover, Lids and Openings	Observe that the container covers and all openings including bungs, hatches and sampling ports are closed.	
3. Seals, Gaskets and Latches	Observe that each opening on the container is sealed in the closed position with a gasket and latch except during waste loading, removal, inspection or sampling.	
4. Operational Requirements		
a. Loading Pumpable Waste	Check that submerged fill pipe container loading is used, container cover remains in place during the process and only openings required for the submerged fill pipe and venting necessary to prevent cover or container damage or deformation are open.	
b. Treatment of Containerized Waste (aeration, thermal, solidification)	Confirm that opening container for treatment purposes is performed under a cover or enclosure equipped with a closed vent system routing all vented container vapors to a control device.	

**INSPECTION CHECKLIST FOR
SURFACE IMPOUNDMENTS [§61.344]**

Equipment	Visual Inspection Procedures	Field Observations
1. General	<p>Observe if the surface impoundment has a cover. Is it an air-supported structure or rigid cover?</p> <p>Observe that there is a closed-vent system routing vented emissions to a control device.</p> <p>Is there a pressure gauge? What is the pressure reading?</p>	
2. Cover and All Openings	<p>Visually inspect cover and openings such as access hatches, sampling ports, and gauge wells. They should be covered completely and free from gaps, tears or holes.</p> <p>Is each opening closed and in the sealed position (covered by a lid that is gasketed and latched) unless sampling, removal or equipment inspection, maintenance or repair is occurring?</p> <p>Is the cover in place during waste storage?</p>	
3. Closed-vent System and Control Device	<p>Visually inspect the enclosure for leaks. Is each cover seal, access hatch or other openings free from cracks or gaps, closed and properly sealed and gasketed?</p>	

**INSPECTION CHECKLIST FOR
INDIVIDUAL DRAIN SYSTEMS [§61.346]**

Equipment	Visual Inspection Procedures	Field Observations
1. General	<p>Visually confirm individual drain system openings are covered and a closed vent system is in place to route collected vapors to a control device.</p> <p>Is there a pressure gauge? What is the pressure reading?</p>	
2. Covers, Seals and Gaskets	<p>Visually check all openings for covers. Are covers maintained in the closed and sealed position at all times except when the opening is used for waste sampling, removal, inspection, maintenance or repair?</p> <p>Visually inspect seals for cracks or gaps.</p> <p>Determine visually whether access hatches and other openings have been gasketed properly. Are gaskets in good condition?</p> <p>Is drain system operating under vacuum? If so, locate pressure indicator and record pressure.</p>	
3. Alternative for Individual Drain Systems	<p>If individual drain systems are not covered and equipped with closed-vent systems and control devices they must comply with alternative requirements.</p>	
a. Drains	<p>Is each drain equipped with water seal controls or a tightly sealed cap or plug?</p> <p>Is adequate water level maintained in water seal?</p>	
b. Junction Box Covers	<p>Visually confirm each junction box is equipped with a cover.</p> <p>Visually confirm the presence of a seal around the perimeter of the junction box cover. Is the seal free from cracks or gaps?</p> <p>Is the junction box cover in place except during inspection and maintenance?</p>	

**INSPECTION CHECKLIST FOR
INDIVIDUAL DRAIN SYSTEMS [§61.346]**

Equipment	Visual Inspection Procedures	Field Observations
c. Vent Pipe	<p>If water seal controls are used to prevent vapor emissions from junction box, is an adequate water level maintained?</p> <p>Confirm that each vent pipe is at least 90 cm (3 feet) in length and 10.2 cm (4 inches) or less in diameter.</p> <p>Confirm presence of a flow indicator on vent pipes and a system to prevent discharge of organic vapor during normal operation or vent pipe must be connected to a closed-vent connected to a control device.</p> <p>Is flow indicator on the vent pipe showing flow from the junction box?</p>	
d. Sewer Lines	<p>Visually check sewer lines for covers or enclosure preventing atmospheric emissions.</p> <p>Check joints, seals, and all interfaces to determine if cover or enclosure is free from cracks or gaps.</p> <p>Visually inspect unburied portion of sewer line for broken seals, cracks or gaps.</p>	

**INSPECTION CHECKLIST FOR
OIL-WATER SEPARATORS [§61.347]**

Equipment	Visual Inspection Procedures	Field Observations
1. General	Confirm the presence of a fixed-roof and closed-vent system routing collected vapors to a control device for each oil-water separator. Is there a pressure gauge? What is the pressure reading?	
2. Fixed Roof Cover and Openings	Observe if fixed-roof openings are closed and sealed (covered by a lid that is gasketed and sealed) except during sampling, inspection, maintenance or repair. Observe that cover and openings in the fixed roof such as access hatches, sampling ports, and gauge wells are free from cracks, gaps, and broken or torn seals and gaskets.	

INSPECTION CHECKLIST FOR CONTROL DEVICES [§61.349]

Equipment	Visual Inspection Procedures	Field Observations
1. General	<p>Verify that there is a control device associated with the waste management unit. What type of control device is used?</p> <p>Confirm control device is operating when waste is placed in the waste management unit vented to the control device (except when maintenance or repair is conducted).</p> <p>Is there a bypass line that could divert the vent steam from the control device? Is it secured in a closed position or is there a flow monitor at the bypass entrance?</p>	
2. Incinerator		
a. Thermal Vapor Incinerator	<p>Confirm presence and operation of a temperature monitoring device equipped with a continuous recorder.</p> <p>Observe that the temperature sensor is installed at a representative location in the combustion chamber.</p>	
b. Catalytic Vapor Incinerator	<p>Confirm presence and operation of a temperature monitoring device equipped with a continuous recorder.</p> <p>Observe that the two temperature monitoring devices are located in the gas stream before and after the catalyst bed and not in the firebox. The inspector may be able to confirm this by locating the monitoring recorder and tracing leads to sensors.</p>	

**INSPECTION CHECKLIST FOR
CONTROL DEVICES [§61.349]**

Equipment	Visual Inspection Procedures	Field Observations
3. Flares	<p>Is the flare equipped with a monitoring device to detect flame presence?</p> <p>Is the flare steam, air or nonassisted?</p> <p>Observe that there is a flame at all times when emissions are vented to the flare.</p> <p>Does the flare emit visible emissions? Do visible emissions exceed the allowable limit (5 minutes per 2 hour period according to Method 22)?</p>	
4. Boiler or Process Heater		
a. Less than 44 Megawatts	<p>Confirm that there is a temperature monitoring device in the firebox.</p> <p>Is the temperature monitoring device equipped with a continuous recorder?</p> <p>Is the recorder operational?</p>	
b. 44 Megawatts or Greater	<p>Confirm that there is a monitoring device equipped with a continuous recorder. What parameter(s) are monitored?</p>	
5. Condenser	<p>Observe presence and operation of either:</p> <ol style="list-style-type: none"> 1) Monitoring device and continuous recorder to measure the concentration level of the organic compounds in the exhaust vent stream from the condenser or, 2) A temperature monitoring device with continuous recorder monitoring temperature in the exhaust stream from the condenser and in the coolant fluid existing the condenser. 	

**INSPECTION CHECKLIST FOR
CONTROL DEVICES [§61.349]**

Equipment	Visual Inspection Procedures	Field Observations
6. Carbon		
Adsorption	Is a monitoring device present that indicates the outlet gas stream concentration of organic compounds from each bed to track breakthrough or measures a parameter that indicates the carbon bed is regenerated on a regular time cycle?	
a. Regenerative Carbon Adsorption System	<p>Is the monitoring device equipped with a continuous recorder? Is the device working properly?</p> <p>Is the fan operating?</p> <p>Observe if there is any visible corrosion on the shell of the adsorber or in the ductwork.</p>	
b. Non-Regenerative Carbon Adsorption System	<p>Visually check for documentation that breakthrough monitoring is being conducted and that carbon has been changed (i.e., a schedule posted with the last carbon replacement indicated).</p> <p>Observe if there is any visible corrosion on the shell of the adsorber or in the ductwork.</p>	

**INSPECTION CHECKLIST FOR
FIXED ROOF STORAGE VESSELS WITH A CLOSED VENT SYSTEM
AND CONTROL DEVICE [§61.343 and §61.356]**

Equipment	Record Inspection Procedures	Observations
1. Closed Vent System	<p>Review facility records. Have facility records been kept for two years? Are annual leak detection measurements conducted on the closed vent system? Note cases where leak detection measurements exceeded 500 ppm above background levels except during routine maintenance.</p> <p>Is there documentation that these leaks have been repaired? Are leaks repaired as soon as practicable, but not later than 45 days. If repair is delayed, was it justified?</p>	
2. Control Devices	<p>Are monitoring records being kept for the control device? Compare facility results with field inspection notes.</p> <p>Does the control device reduce inlet benzene emissions by 95 percent or greater? Indicate control device efficiency and calculations.</p> <p>Check records to determine if control device was out of compliance during maintenance for more than 72 hours per year. If out of compliance, document record findings.</p> <p>Are quarterly reports filed? Do the reports indicate each occurrence that resulted in excess emissions?</p> <p>Verify that the facility has a record of the measured values of the monitored parameters for the control device. Check field notes to verify that the same parameters are being monitored.</p>	

**INSPECTION CHECKLIST FOR
FIXED ROOF STORAGE VESSELS WITH A CLOSED VENT SYSTEM
AND CONTROL DEVICE [§61.343 and §61.356]**

Equipment	Record Inspection Procedures	Observations
	Does the facility keep maintenance records for the control device? Does the facility keep records for the control device when the facility is experiencing malfunctions or upset conditions and their effects on the control device? Do the records include the following: duration of noncompliance periods due to maintenance/upset, dates and times of noncompliance periods at the beginning and conclusion of maintenance/upset and continuous records of liquid levels in each storage vessel that uses the closed vent system and control device during the maintenance/upset noncompliance periods?	

**INSPECTION CHECKLIST FOR
EXTERNAL FLOATING ROOF STORAGE VESSELS [§61.351 and §61.356]**

Equipment	Record Inspection Procedures	Observation
1. External Floating Roof	Determine that the facility is fulfilling record keeping requirements. Tank inspections, maintenance and other monitoring information is to be kept on file for two years. Compare facility records of tank seal gap measurements with those contained in annual reports. Note any discrepancies in seal gap measurements. Are records complete for both primary and secondary seal gap measurements?	
2. Closure Device		
a. Primary Seal	<p>Check records to verify that the seal is either a metallic shoe seal or a liquid-mounted seal (in contact with the liquid). Check records to verify that the seal is continuous.</p> <p>Using facility measurements from the latest inspection, note date of last inspection and how frequently inspections are being conducted. Determine if seal gaps exceed 212 cm² per meter (10.0 in.² per foot) and if the width of any gap exceeds 3.81 cm (1.5 in.). Were facility gap measurements taken at four locations along the roof? Do facility inspection measurements agree with field inspection results? Note discrepancies.</p>	
i. Metallic Shoe	<p>For metallic shoe seal, check facility records to verify that the flexible coated fabric spans the entire space between the metal seal and the vessel wall.</p> <p>Determine that one end of the metallic shoe seal extends into the stored liquid and the other extends a minimum vertical distance of 61 cm (24 inches) above the liquid surface. Facility records should indicate the dimensions of the metallic shoe seal.</p>	

**INSPECTION CHECKLIST FOR
EXTERNAL FLOATING ROOF STORAGE VESSELS [§61.351 and §61.356]**

Equipment	Record Inspection Procedures	Observation
ii. Liquid-Mounted	Determine from records if liquid mounted seal was in contact with the liquid at the time of the last facility inspection. Determine from records if the seal is either a liquid-filled or a foam-filled seal.	
b. Secondary Seal	Determine from facility records whether a secondary seal is installed above the primary seal. Use facility inspection records to determine if gaps exceed 21.3 cm ² per meter (1.0 in ² per foot) and the width of any gap exceeds 1.27 cm (0.5 in.). Do facility inspection measurements agree with field inspection results? Note any discrepancies.	

**INSPECTION CHECKLIST FOR
INTERNAL FLOATING ROOF STORAGE VESSELS [§61.351 and §61.356]**

Equipment	Record Inspection Procedures	Observation
1. Internal Floating Roof (IFR)	<p>Determine if facility design records were followed for installment. If not, request supporting information. Use facility design records to determine the following information:</p> <p>Are all sampling well penetrations into the IFR equipped with a slit fabric cover that covers 90 percent of the opening?</p> <p>Are ladder passages equipped with a gasketed sliding cover?</p> <p>Are column support penetrations equipped with a flexible fabric sleeve or a gasketed sliding cover?</p>	
2. Closure Device	<p>Do any facility records indicate a closure device is present on the IFR? Do inspection records indicate the closure device is continuous?</p> <p>Compare any visual inspection data recorded on the attached tank floating roof drawing with facility inspection record data. Compare facility gap measurements with identified seal gaps.</p> <p>Are facility calculations correct or are any gaps exceeding the width or length proportions?</p> <p>What type of seal is used (foam or liquid seal, two seal or metallic shoe seal)?</p>	
a. Foam or Liquid Seal	Do inspection records show the seal is installed in contact with the liquid (liquid-mounted)?	
b. Two Seals	Do design and inspection records show there are two seals, one above the other?	

**INSPECTION CHECKLIST FOR
INTERNAL FLOATING ROOF STORAGE VESSELS [§61.351 and §61.356]**

Equipment	Record Inspection Procedures	Observation
c. Metallic Shoe Seal	Do records show that seal was designed and still operates with a flexible coated fabric spanning the entire annular space between the metal shoe and the edge of the IFR?	
	When was the seal last inspected? How frequently are inspections being conducted?	
3. Automatic Bleeder Vents	Verify through record inspection that the vents are gasketed.	
4. Rim Space Vents	Verify through record inspection that the vents are gasketed.	
5. Well Penetrations	Does each penetration (except vents) in a non-contact IFR project below the liquid surface?	
6. Covers and Lids	Check the design records to determine if all penetrations through the roof have a cover or lid and a gasket? (Leg sleeves, automatic bleeder vents, rim space vents, column wells, ladder wells, sample wells, and stub drains must comply with their individual closure requirements as previously mentioned).	
	Check if covers for access hatches and automatic gauge float wells are bolted.	

**INSPECTION CHECKLIST FOR
CONTAINERS [§61.345 and §61.356]**

Equipment	Record Inspection Procedures	Observations
1. Recordkeeping Requirements	<p>Locate and obtain records. Check records for completeness.</p> <p>Check quarterly, visual inspection records for container covers and openings.</p> <p>For identified defects (broken seal, gasket or other problem), was method and date of repair recorded?</p> <p>Was repair effort attempted as soon as practical but not more than 15 calendar days after detection? If repair was delayed, was it justified?</p>	
2. Annual Leak Detection Inspection	<p>Check records of annual leak detection inspection (Method 21) for covers and all openings including bungs, hatches, and sampling ports. Was emission level and inspection date recorded?</p>	
a. Covers and All Openings	<p>Do records show leak inspections performed initially and thereafter at least once per year?</p> <p>For identified leaks (emission levels exceeding 500 ppmv above background), was repair attempted as soon as practical but no later than 15 calendar days after detection? If repair was delayed, was it justified?</p>	
b. Closed Vent System or Treatment Covers	<p>Check records to confirm if closed vent system including all openings, door hatches, ductwork, and connections operated with no detectable emissions (i.e., less than 500 ppmv above background). Records should indicate initial and annual leak detection testing results.</p> <p>For identified leaks (above 500 ppmv above background), was repair attempted as soon as practical but not later than 15 calendar days after detection? If repair was delayed, was it justified?</p>	

**INSPECTION CHECKLIST FOR
CONTAINERS [§61.345 and §61.356]**

Equipment	Record Inspection Procedures	Obervations
c. Control devices	<p>Check records to confirm the control device destroys or recovers vented emissions by 95 weight percent or greater.</p> <p>Determine through record examination of continuous records that the control device was operational during period when receiving container vented emissions.</p>	

**INSPECTION CHECKLIST FOR
SURFACE IMPOUNDMENTS [§61.344 and §61.356]**

Equipment	Record Inspection Procedures	Observation
1. Annual Inspection	Check records to verify compliance with annual emissions limits for the fixed roof cover and all openings (less than 500 ppmv above background).	
2. Visual Quarterly Inspection	Verify visual inspection results and test date. Is visual inspection conducted on a quarterly basis? When broken seals, cracked gaskets or other problems are identified in the visual inspection was the first repair effort made within 15 calendar days? If repair was delayed, was it justified?	

**INSPECTION CHECKLIST FOR
INDIVIDUAL DRAIN SYSTEMS [§61.346 and §61.356]**

Equipment	Record Inspection Procedures	Observations
1. Annual Leak Inspection	<p>For individual drain systems using covers and closed-vent systems, check records for test dates and confirm cover on all openings operate with no detectable emissions.</p> <p>Was the leak detection inspection conducted according to Method 21 (i.e., were calibration tests conducted for each species and response times recorded)?</p> <p>Does source operate under vacuum? If so, is the pressure monitored continuously?</p> <p>For emissions of 500 ppm above background, determine if there are any leaks present and describe the source of the leak.</p>	
2. Quarterly Visual Inspection	<p>Check records for test results and dates of visual inspection of each cover seal, access hatch and other openings. Confirm efforts to repair were made within 15 calendar days. If repair was delayed, was it justified?</p>	

**INSPECTION CHECKLIST FOR
OIL-WATER SEPARATORS [§61.347 and §61.356]**

Equipment	Record Inspection Procedures	Observations
1. Annual Leak Inspection	<p>Check records of annual leak detection inspection (Method 21) for the fixed-roof openings such as access hatches and sampling ports and closed-vent system. Was emission level and inspection date recorded? Were any leaks (500 ppmv above background) identified?</p> <p>For identified leaks, was repair attempted as soon as practical but not later than 15 calendar days? If repair was delayed, was it justified?</p> <p>Determine through record examination that the control device was operational during periods when oil-water separator contained waste.</p>	
2. Facility Visual Inspection	<p>Check the records for dates and results of the quarterly visual inspections.</p> <p>For any noncompliance items such as broken seals or gaskets, verify that first repair efforts were made within 15 calendar days. If repair was delayed, was it justified?</p>	

**INSPECTION CHECKLIST FOR
CONTROL DEVICES [§61.349 and §61.356]**

Equipment	Record Inspection Procedures	Observations
1. General	<p>Review facility records. Is engineering design documentation for all control equipment provided? [§61.356(d)] Are quarterly visual inspections of the control device and closed-vent system conducted?</p> <p>Do records contain a statement by the owner/operator certifying that the closed vent system and control device is designed to operate at the documented performance level when the waste management unit vented to the control device is or would be operating at the highest load or capacity. [§61.356(f)]</p> <p>If engineering calculations are used to determine performance then does the design analysis include specifications, drawings, schematics, and piping and instrumentation diagrams that describe the control device based on acceptable engineering texts? [§61.356(f)]</p> <p>For identified visible defects such as holes in ductwork or piping and loose connections, do the repair records show that the first effort to repair was made within 5 days and repairs were completed within 15 calendar days? If repair was delayed, was it justified?</p> <p>Are annual leak detection measurements conducted on the closed-vent system?</p> <p>Note cases where leak detection measurements exceeded 500 ppmv above background levels.</p> <p>Is there documentation that these leaks were repaired? Note any discrepancies.</p>	

**INSPECTION CHECKLIST FOR
CONTROL DEVICES [§61.349 and §61.356]**

Equipment	Record Inspection Procedures	Observations
	<p>Check daily operating data from monitoring equipment (e.g., temperature monitors or flow indicators) to confirm control device is operating properly. Record data.</p>	
<p>2. Control Device (Incinerator, Boiler or Process Heater)</p>	<p>Determine from record examination (engineering calculation or performance test) that the control device meets one of the following:</p> <ul style="list-style-type: none"> a) Reduce organic emissions vented to it by 95 weight percent or greater; b) Achieves a total organic compound concentration of 20 ppmv on a dry basis correct to 3 percent oxygen; or c) Provide a minimum residence time of 0.5 seconds at a minimum temperature of 760°C. 	
<p>3. Vapor Recovery System (Carbon Adsorption or Condenser)</p>	<p>Determine from record examination that carbon adsorption system recovers organic emissions vented to it with an efficiency of 95 weight percent or greater. Demonstration of appropriate conditions may be by:</p> <ul style="list-style-type: none"> 1) engineering calculations, or 2) performance tests. 	
<p>4. Non-Regenerative Carbon Adsorber</p>	<p>Verify carbon is replaced according to scheduled replacement intervals? Note the schedule replacement intervals.</p>	

**INSPECTION CHECKLIST FOR
CONTROL DEVICES [§61.349 and §61.356]**

Equipment	Record Inspection Procedures	Observations
4. Flares	<p>Check records for periods when flare operated with visible emissions. Note all violations of visible flare emission exceeding 5 minutes during any 2 consecutive hours.</p> <p>Check that records are kept for any periods of pilot flame absence during the loading cycle.</p> <p>Determine the net heat value of the fuel.</p>	

INSPECTION CHECKLIST FOR QUARTERLY REPORTS [§61.357]

Equipment	Record Inspection Procedures	Observations
1. For treatment process or wastewater treatment system:	<p>If monitored by collection under §61.354(a)(1), each period of operation during which the concentration of the benzene exiting the unit is ≥ 10 ppmw.</p> <p>If continuously monitored under §61.354(a)(2), each 3-hour period of operation during which the average value of the monitored parameter is outside the range of acceptable values or during which the unit is not operating as designed.</p> <p>If unit is monitored in accordance with §61.354(b) (aggregating or mixing waste), each period of operation during which the flow-weighted annual average concentration of benzene in the stream entering the unit is ≥ 10 ppmw and/or the total annual benzene quantity is ≥ 1.0 Mg/yr.</p>	
2. For a control device:		
Thermal vapor incinerator	Each 3-hour period of operation during which the average temperature of the gas stream in the combustion zone is more than 28°C below the design combustion zone temperature.	
Catalytic vapor incinerator	Each 3-hour period of operation during which the average temperature of the gas stream immediately before the catalyst bed is more than 28°C below the design gas stream temperature, and any 3-hour period during which the average temperature difference across the catalyst bed (i.e., the difference between the temperatures of the gas stream immediately before and after the catalyst bed), is less than 80 percent of the design temperature difference.	

**INSPECTION CHECKLIST FOR
QUARTERLY REPORTS [§61.357]**

Equipment	Record Inspection Procedures	Observations
Boiler or process heater	Each 3-hour period of operation during which the average temperature of the gas stream in the combustion zone having a design heat input capacity less than 44 MW is more than 28° C below the design combustion zone temperature.	
Carbon adsorber, condenser, or other vapor recovery system	Each 3-hour period of operation during which the average concentration of organics or the average concentration of benzene in the exhaust gases is more than 20 percent greater than the design concentration level of organics or benzene in the exhaust gas.	
Condenser	Each 3-hour period of operation during which the temperature of the exhaust vent stream is more than 6° C above the design average exhaust vent stream temperature, or the temperature of the coolant fluid exiting the condenser is more than 6° C above the design average coolant fluid temperature at the condenser outlet.	
Flare	Each period in which the pilot flame is absent.	
Boiler or process heater	Each occurrence when there is a change in the location at which the vent stream is introduced into the flame zone.	
Regenerable carbon adsorber system	Each occurrence when the carbon is not regenerated at the predetermined carbon bed regeneration time.	
Non-regenerable carbon adsorber system	Each occurrence when the carbon is not replaced at the predetermined interval specified in §61.354(c).	
Other control device	Each 3-hour period during which the parameters monitored are outside the range of values specified in §61.349(a)(2)(iv)(C), or any other periods specified by the Administrator for a control device.	

**INSPECTION CHECKLIST FOR
QUARTERLY REPORTS [§61.357]**

Equipment	Record Inspection Procedures	Observations
Cover and closed-vent system monitored under §61.354(g)	Any period in which the pressure in the waste management unit is equal to or greater than atmospheric pressure (emission control that is maintained at a pressure less than atmospheric pressure).	
3. For all inspections required by §§61.342 through 61.354	<p>An annual report to the Administrator that summarizes all inspections required by the sections named above during which detectable emissions are measured or a problem (such as a broken seal, gap or other problem) than could result in benzene emissions is identified, including information about the repairs or corrective action taken.</p> <p>Quarterly reports completed by the facility must include a certification that all of the required inspections have been carried out.</p>	

GENERAL RECORD INSPECTION CHECKLIST

General Information	Observations
Are records maintained at facility site for a period not less than two years from the date the information is recorded? [§61.356(a)]	
Are records maintained that identify each waste stream at the facility subject to the NESHAP? Do records indicate whether or not the waste stream is controlled for benzene emissions? [§61.356(b)]	
What is the TAB value for the facility? Is determination of the TAB value documented?	
Are the number of subject waste management units documented? Date of when controls were installed?	
For waste streams not controlled for benzene emissions subject to this subpart, do the records contain the following: test results, measurements, calculations, and other documentation used to determine waste stream identification, water content, whether or not waste stream is a process wastewater stream, annual waste quantity, range of benzene concentrations, annual average flow-weighted benzene concentrations, and annual benzene quantity? [§61.356(b)(1)]	

INSPECTION CHECKLIST (EXEMPTIONS)

Exemptions	Observations
<p>1. Basic Rule For waste streams exempt from basic rule in accordance with §61.342(c)(3) [2 Mg exemption], do records include one of the following:</p> <ul style="list-style-type: none"> • measurements to determine continuous flow of process wastewater is less than 0.02 liters per minute <u>or</u> • annual quantity of process wastewater is less than 10 Mg/yr <u>or</u> • measurements to determine that the TAB in all exempt waste streams does not exceed 2.0 Mg/yr. [§61.356(b)(2)] 	
<p>2. Process WW For process wastewater streams controlled for benzene emissions in accordance with §61.342(d), do records include for each treated process wastewater stream all measurements and calculations used to determine the annual benzene quantity in process wastewater exiting the treatment process [§61.356(b)(3)]</p>	
<p>3. 6 BQ For facilities using the treat-to-a-target benzene quantity exemption, [(§61.342(e)] do records show each waste stream measurements, location of measurements, and calculations used to determine that the total benzene quantity does not exceed 6.0 Mg/yr. Identify which units are/are not controlled for air emissions. [§61.356(b)(4)]</p>	

INSPECTION CHECKLIST (EXEMPTIONS)

Exemptions	Observations
<p>4. Process unit turnaround waste</p> <p>Is the annual waste quantity for process unit turnaround waste averaged? Do records include all test results, measurements, and calculations used in order to determine the following:</p> <ul style="list-style-type: none">• identification of each process unit at the facility that undergoes turnarounds;• date of the most recent turnaround for each process unit;• identification of each process unit turnaround waste;• annual waste quantity determined under [§61.355(b)(4)];• range of benzene concentrations in the waste;• annual average flow-weighted benzene concentration of the waste; and• annual benzene quantity [§61.356(b)(5)]	

INSPECTION CHECKLIST FOR WASTES SENT OFFSITE

Offsite Wastes	Observations
<p>For wastes transferred offsite to another facility for treatment [§61.342(f)] for each offsite waste shipment, do records include date waste is shipped offsite, quantity of waste shipped offsite, name and address of the facility receiving the waste, and a copy of the notice sent with the waste. [§61.356(c)]</p>	

5.0 HEALTH AND SAFETY

The purpose of this section is to present general health and safety information that the inspector should know before inspecting waste operations that are subject to the benzene NESHAP regulations. The dangers associated with benzene exposure are described and precautions and safety guidelines that should be followed during a compliance inspection are identified. Reference materials are identified that present additional information and guidelines that should be closely reviewed and adhered to by the inspector.

5.1 Health Hazard Information

The Agency for Toxic Substances and Disease Registry has determined benzene to be a human carcinogen. For this reason, exposure to benzene should be minimized. The inspector must be aware of several regulated concentration limits for benzene. Table 5.1 indicates some important exposure limits for benzene that have been established. The Short Term Exposure Limit (STEL) and the Permissible Exposure Limit (PEL) are maximum concentrations that nearly all workers may be exposed day after day without adverse effects (Reference 1). The National Institute for Occupational Safety and Health (NIOSH) defines the Immediately Dangerous to Life and Health (IDLH) concentration as the level at which exposure "poses an immediate hazard to life or produces immediate irreversible effects on health that will be debilitating" (Reference 2). The inspector must be cognizant of these concentration limits.

Adverse health effects from benzene exposure depend upon the route of exposure and length of exposure. Benzene can be inhaled, ingested, or absorbed through the skin or eyes. Short-term exposure at high levels can cause dizziness, euphoria, giddiness, headache, nausea, staggering gait, weakness, drowsiness, and respiratory irritation. Symptoms usually

disappear after the exposure stops. The long-term effects include injury to blood forming organs, anemia, and leukemia (Reference 3).

TABLE 5.1 EXPOSURE LIMITS FOR BENZENE

	Concentration (ppm)	Time Period
Short Term Exposure Limit (STEL)¹	5	15 minutes
Permissible Exposure Limit (PEL)¹	1	8 hours
Immediate Dangerous to Life and Health (IDLH)²	3000	instantaneous
Odor Threshold²	12	not applicable

¹Occupational Safety and Health Administration

²NIOSH

The inspector should receive a baseline physical and proper health and safety training, as required by EPA Order 1440.2 (Health and Safety Requirements for Employees Engaged in Field Activities) and 29 CFR 1910.1028 prior to undertaking an inspection with a potential for exposure to benzene. This physical should concentrate on the function and integrity of the eyes, skin, liver, and respiratory, nervous, and hematopoietic systems. Annual follow-up physicals and job termination physicals are also recommended. Additional information concerning health and safety training and medical monitoring is found in EPA's "Basic Health and Safety Manual for Field Activities" (Reference 4).

5.2 Safety

5.2.1 Personal Protection Equipment

The inspector should arrive at the waste operation site with all the necessary personal safety and monitoring equipment. The requisite equipment will depend on the nature of the planned inspection activities at the plant. Activities requiring unavailable personal safety or monitoring equipment should not be

performed. The inspector should be prepared with the minimal routine items including a hard hat, steel-toed shoes, gloves and safety glasses (Reference 5). In addition to these items, proper respiratory protection equipment should be taken by the inspector.

Inspectors should be properly trained in the selection and use of respiratory protection equipment before they attempt to use it. Incorrect selection or improper usage could result in harm to and even death of the inspector. Inspectors are not to rely on the facility's respiratory protection and air monitoring equipment. Procedures for respiratory protection are detailed in EPA Order 1440.3 (Respiratory Protection), 29 CFR 1910.134 and 1910.1028, and in "Basic Health and Safety Manual for Field Activities."

The following general respiratory protection procedures which are based on the information presented in the aforementioned references should be followed by the inspector. Prior to entry onto an inspection site the inspector should use direct reading instruments to determine if there is an oxygen deficient atmosphere and to measure the benzene concentration and combustible gas levels. When the concentration is measured, the inspector should use the respiratory protection guidelines established in EPA Order 1440.3 and 29 CFR 1910.134 and 1910.1028 to determine what type of respiratory protection is required. The inspector should verify that the respiratory protection equipment has been certified by NIOSH and the Mine and Safety Health Administration (MSHA). A self-contained breathing apparatus (SCBA) must be used if there is an oxygen deficient atmosphere, if the IDLH for benzene is exceeded or if the concentration has not been measured. Continuous air monitoring should occur during the inspection that will alert the inspector of any changes in benzene or combustible gas concentration or oxygen deficiency. If at any time the concentration exceeds the capabilities of the respiratory protection, the inspector should leave the site immediately and proceed to a safe area. An inspector should carry rescue respiratory protection as a

precautionary measure in the event of an emergency. Air purifying respirators are the least preferred method of respiratory protection, but can be used in emergencies if SCBAs or rescue respirators are not available.

5.2.2 Compliance Inspection Safety Guidelines

The compliance inspection for benzene waste operations can be performed safely and efficiently if the inspector adheres to the following guidelines in addition to the previously mentioned health and safety and respiratory protection requirements.

- Prior to the inspection a safety plan must be developed that specifies the expected hazards and types of exposures to be encountered, needed safety equipment, and an emergency evacuation plan.
- Do not do anything that is, in your judgment, dangerous.
- If the facility's health and safety procedures are more stringent than EPA's, then the inspector should comply with the facility's procedures.
- Stop the inspection immediately whenever you feel any of the following symptoms: headache, nausea, dizziness, drowsiness, loss of coordination, chest pains, shortness of breath, vomiting or eye or nose irritation. These symptoms may be caused by exposure to volatile organic compounds and other pollutants even when there is no odor. The NIOSH odor threshold value for benzene is 12 ppm (Reference 2). Hence, if benzene is smelled, the inspector, dependant upon the duration of exposure, may have already been exposed to benzene concentrations that exceed the STEL and PEL.
- Never hurry during inspections; this causes careless accidents.
- Do not wear contact lenses during inspections.
- Take all personal protection equipment necessary for

the plant to be inspected. If this equipment is not available, then avoid areas of potential exposure.

- Do not make internal inspection of air pollution control or process equipment under any conditions.
- Avoid hot surfaces of the incinerator such as inlet ductwork, outlet ductwork and the incinerator shell.
- Personnel or the owner or operator should be within visual and audible distance of inspector.
- Inspectors should be aware that there are areas that are likely to exceed safe benzene concentration limits. Such areas are common around leaks in positive pressure equipment, on floating roof storage tanks, in weather enclosures above control equipment, and in any area with poor ventilation.
- Only intrinsically safe portable instruments should be used when inspection locations are classified as hazardous. The instrument must be certified safe for the specific location class and group.
- Extreme caution is necessary whenever walking across roofs. Weak spots are not always apparent.
- Skin that comes in contact with benzene should be promptly washed with soap and water.
- Smoking, sparks, and open flames are not permitted near the inspection site.
- Material Safety Data Sheets (MSDS) for benzene should accompany the inspector.

5.3 References

1. "Occupational Safety and Health Guideline for Benzene", U.S. Department of Health and Human Services, 1988.
2. "NIOSH Pocket Guide to Chemical Hazards", U.S. Department of Health and Human Services, June 1990.
3. "Toxicological Profile for Benzene", U.S. Public Health Service, Contract DW89932147-01-3, December 1987.
4. "Basic Health and Safety Manual", EPA Contract 68-W8-0097, May 1989.
5. "Basic Inspector Training Course: Fundamentals of Environmental Compliance Inspections", EPA, February 1989.

APPENDIX A

Related Questions and Answers

**APPENDIX A
VARIOUS QUESTIONS AND ANSWERS**

APPLICABILITY

1. Are tanks an integral part of a process when they are used for feedstocks, products, off-specification products, intermediates, or similar purposes and utilize closed piping systems? What if these streams contain 10 percent or greater water?

Response: First, it is not relevant that a tank uses closed piping systems or that the streams contain 10 percent or more water in determining whether a tank is an integral part of the process. In the question, the reference to "integral part of a process" is related to the determination of point of generation, where the total annual benzene quantity (TAB) for wastes must be determined. However, the first step is to determine if the material in the tank meets the broad definition of waste. Then the point of generation must be determined, which will include a decision of whether the tank is integral to the production process.

The definition of wastes is quite broad. In order to be a waste, a material must be discarded, or accumulated, stored, or treated (physically, chemically, thermally, or biologically), prior to being discarded, recycled, or discharged. If a material that meets the definition of waste is managed in the tank, the tank is a waste management unit. In the examples provided in the question, off-specification products probably would be classified as wastes. Feedstocks, intermediates, and products would not be wastes.

The point of waste generation is defined as "the location where the waste stream exits the process unit component or storage tank prior to handling or treatment in an operation that is not an integral part of the production process, . . ." There is not a definition of "integral to the process" in the regulation, but such a determination may be based on physical, chemical, economic, or other factors. A question to be asked is could, or would, the production process be operated without the tank or other component? The burden is on the owner/operator to demonstrate why a tank or other component is integral to the process.

If a sidestream is taken from the primary production process, the tank that manages this "waste" is probably not integral to the process, even if the waste is recycled back to the primary production process, is an intermediate, or is

sold as an off-specification product.

If it is determined that the tank is a waste management unit that is not integral to the process, then the point where the stream leaves the production process would be the point of generation. If this waste stream contained greater than 10 percent water at this point of generation (or is later mixed with another stream so that resulting stream contains greater than 10 percent water), it must be included in TAB. In addition, if the stream contains 10 ppm of benzene or greater, and the facility had a TAB of 10 Mg/yr or greater, the tank would need to be controlled in accordance with §61.343.

- 2. In the case of refinery desalter effluent brine, where is the required point of measurement for the annual TAB assessment?**

Response: First, a distinction should be made between the point of measurement and the point of determination for TAB. Except for the special cases listed in §61.355(b)(1-4) and (c)(1)(i)(A-D), TAB must be determined at the point of waste generation. If a facility is basing its determination on knowledge of the waste, the benzene content of the waste could be measured at a point different from the point of generation, as long as this point is prior to any treatment. However, the facility would need to fully document how this measurement was used to estimate the benzene content at the point of generation.

It appears that the real issue in this question is the point of waste generation for refinery desalter effluent brine. The point of waste generation is usually found where the effluent brine exits the desalter.

- 3. In the case of refinery desalter effluent brine that is hard piped to a benzene recovery unit, may the point of measurement be moved downstream of the benzene recovery unit?**

Response: No. There are two ways to determine TAB, as described in §61.355(c)(2) and (3). Section 61.355(c)(2) allows the determination of the flow-weighted annual average benzene concentration using knowledge of the waste. However, as noted above, measurements used to determine benzene content of a stream must be made before any treatment to remove or recover benzene.

If the flow-weighted annual average benzene concentration is measured in accordance with §61.355(c)(3), the procedures in that section must be followed. Therefore, in no instance would a measurement made downstream of a benzene recovery

unit be acceptable in the determination of TAB.

4. If a refinery's TAB exceeds 10 metric tons per year without inclusion of turnaround wastes, must turnaround wastes be included in the annual TAB calculation even if the facility collects, controls, and treats all affected turnaround waste streams? (The collection of representative turnaround waste samples can be difficult.)

Response: The waste quantity, benzene concentration (average and range), and benzene quantity must be reported for all wastes. The reporting and recordkeeping requirements are critical tools to assess compliance with the standard. However, extensive sampling and analysis of these wastes may not be needed if knowledge of the waste provides an acceptable estimate, as contained in §61.355(c)(2).

For example, suppose that the maximum quantity of the waste ever generated was 1,000 Mg/yr and the benzene concentration never exceeded 100 ppm. For the TAB report, the concentration could be listed as less than 100 ppm, the waste quantity as less than 1,000 Mg/yr, and the benzene quantity as less than 0.1 Mg/yr. The waste stream would be identified as one that would be controlled.

5. Does the introduction of streams other than sour water streams (in addition to sour water streams) affect the sour water stripper provisions in any way? Is the benzene content of these streams still counted at their point of generation? How do you account for the benzene stripped from these other units when counting the benzene content of the stream exiting the sour water stripper? It will contain trace amounts of benzene from both the sour and non-sour water streams.

Response: As noted in the response to question #2, TAB must be determined at the point of waste generation, except for certain special cases. One of these cases is sour water strippers, where TAB for sour water streams may be determined at the point where the water exits the sour water stripper.

The regulation does not contain a stipulation that, in order to utilize this special case for TAB determination, the sour water stripper only handle sour water streams. Therefore, this provision can be used for the situation described in the question, but the TAB determination is made after stripping only for sour water streams. However, the problem becomes how to account for the benzene in the various streams entering the sour water stripper.

The benzene content of the non-sour water streams must be counted at their point of waste generation. The regulation does not allow the treating of waste to lower TAB, which would be the situation if the benzene for these streams were counted after the sour water stripper. However, the stream exiting the sour water stripper would contain benzene from the sour water stream (which needs to be counted in TAB) and the non-sour water stream (which has already been counted). Therefore, to avoid double counting, the benzene in the exit stream that resulted from the non-sour water stream may be subtracted. If such a deduction is made, it will be the responsibility of the owner/operator to adequately demonstrate the methodology for determining the relative amounts of benzene from the sour water and non-sour water streams.

6. If a unit was not designed to be a sour water stripper but to strip benzene, is it still a covered "sour water stripper", i.e., must the unit only have been designed to be a sour water stripper?

Response: The EPA will not allow the sour water stripper provision to be a loop-hole that allows facilities to treat out of the rule. The intent of the sour water stripper provision was that the sour water stream was one that the facility had been treating in a sour water stripper for the express purpose of reducing the hydrogen sulfide, either for safety reasons or to control odor. Therefore, if the stripper was designed to strip benzene, EPA would probably not allow the facility to determine the TAB after the stripper.

7. Sour water strippers are defined as units that: (1) are designed and operated to remove ammonia or sulfur compounds from sour water streams, (2) has the sour water streams transferred through hardpiping or other enclosed system, and (3) is operated in such a manner that the offgases are sent to a sulfur recovery unit, processing unit, incinerator, flare, or other combustion device. If the offgases go from the stripper to a tank to a solvent recovery unit, is the unit no longer a "sour water stripper"? Also, is it correct to assume the benzene content is counted as the stream leaves the stripping unit, but before it enters the tank?

Response: The response given to the preceding question should be noted. The EPA will not allow facilities to treat out of the regulation using the sour water stripper provisions. If the offgases go from the stripper to a tank to a solvent recovery unit, the unit does not meet the definition of a sour water stripper, and the benzene must be counted at the point of generation for all streams entering the stripper. However, if the offgases are sent from the

stripper to a tank, then to a "sulfur recovery unit, processing unit, incinerator, flare, or other combustion device", then the stripper can be a sour water stripper, as long as there is no opportunity for the offgases to vent to the atmosphere prior to reaching the sulfur recovery unit, processing unit, etc.

The benzene contained in the offgases is not included in TAB. If the intent of the second question was to ask where the benzene was measured if the water stream was sent to a storage tank, then the answer is at the point where it leaves the sour water stripper, if the unit qualifies as a sour water stripper.

8. Sour water stream - the rule discussed a 10 ppm level for hydrogen sulfide (H_2S) or ammonia (NH_3). What if the levels of H_2S and NH_3 are both less than 10 ppm, but the total of the two is greater than 10 ppm? Is the stream a sour water stream?

Response: No, the stream in this example is not a sour water stream. The concentration of at least one of the compounds, either ammonia or hydrogen sulfide, must be 10 ppm or higher. The sum of the two concentrations is not compared to 10 ppm to determine if the waste is a sour water stream under the rule.

9. The definition of a sour water stream states that a sour water stream contains sulfur compounds in concentrations greater than 10 ppm by weight or more, and specifically mentions hydrogen sulfide in parentheses. Sulfates and sulfites are sulfur compounds. Do streams that contain sulfates or sulfites in concentrations greater than 10 ppm qualify as sour water streams?

Response: It was the EPA's intent that the TAB provisions for sour water strippers be applied only to those waste streams that required treatment in the stripper to remove hydrogen sulfide (or ammonia). However, as correctly noted in the question, the definition of a sour water stream refers to sulfur compounds, and mentions hydrogen sulfide in parenthesis. However, it should be noted that this only refers to one of the three criteria in the definition of a sour water stream. The third criterion is that the stream requires treatment to remove the ammonia or sulfur compounds. The intent of this third criterion in the definition was to prevent facilities from using the special provisions for sour water strippers as a way to avoid controls through waste treatment by sending their wastes to a sour water stripper, and reducing their TAB to below 10 Mg/yr. Consequently, in order for a facility to classify

streams containing sulfates and sulfites as sour water streams, evidence would have to be provided that showed it is necessary (and probably that it was necessary prior to proposal of the rule) to treat these streams in a sour water stripper to remove the sulfites and sulfates. The EPA does not believe that any stream could be classified as a sour water stream due to sulfate or sulfite content, based on this criterion.

10. Since the rule talks about characterizing each "waste stream," and the definition of waste stream gives examples pertinent to liquid wastes, is the rule only applicable to liquid wastes?

Response: No. A waste stream can be any waste generated by a particular process unit, product tank, or waste management unit, not just liquid. The examples given in the waste stream definition are limited examples only and are not meant to be all inclusive.

11. If a material leaves a chemical plant, refinery or by-product plant as a product and then become waste (e.g., a spill makes it a "U" waste under RCRA regulations) not on the site of a chemical plant, refinery or by-product plant, is that a waste that has to be included in the TAB? Another example is used oil; it started out as a product when it left the refinery and became a waste off the refinery site.

Response: No. The rule applies to materials at TSDF that leave the petroleum refinery, chemical plant or coke by-product plant as a waste. However, if a product spill took place at a petroleum refinery (or chemical or coke by-product plant), the resulting waste would have to be counted in the receiving TSDF TAB because it became a waste at the refinery (or chemical or coke by-product plant).

12. Does landfill leachate generated at a TSDF have to be counted in the TAB?

Response: If the landfill contains wastes generated prior to this rule by one of the three industries described above, the benzene in the leachate should be included in the TAB. The leachate is a new waste generated from a waste from one of the affected industries. If the facility can demonstrate that the benzene in all of the wastes from which the leachate was generated was included in the TAB when the wastes were received at the TSDF, the benzene in the leachate would not be included (i.e., there should be no double counting of benzene in determining TAB).

13. How are plant emergencies viewed under the rule? For example, a refinery unit processing an intermediate stream

containing 5 percent benzene experiences a pipe break and the resulting spill creates a flash fire. In extinguishing the fire, the refinery uses a large amount of water and creates a benzene containing stream that cannot be collected in a system meeting the benzene waste NESHAP standards. Does the benzene in this stream count towards the facility's TAB and/or the facility's annual exemption from treatment of 2 Mg per year?

Response: The regulation does not contain any exemption for wastes generated by plant emergencies. Therefore, the benzene-containing stream in this situation would count towards the facility's TAB for the year in which it is generated. In addition, if the waste contains 10 ppm or more benzene and the facility has a TAB of 10 Mg/yr or greater, the waste is subject to the control requirements of the rule.

This waste stream would be eligible for exemption from control. However, if the stream were exempted under the 2.0 Mg/yr exemption contained in §61.342(c)(3)(ii), the benzene would count toward the 2.0 Mg/yr.

14. Can the averaging of process unit turnaround wastes for the purpose of the facility TAB determination be used for tank turnarounds that occur over approximately a 10-year period?

Response: There are two issues to address within this question. One is whether the benzene in tank turnaround wastes can be averaged for TAB. The second is regarding the acceptable time frame for turnaround waste averaging.

The provisions allowing averaging of turnaround wastes are for process units. A tank does not meet the definition of a process unit, although a tank can be a part of a process unit. If a "tank turnaround" is part of a process unit turnaround, then averaging of tank turnaround wastes is allowed. Averaging is not permitted for tank turnarounds of typical storage tanks.

The only restriction regarding the length of time that can be used to average process unit turnaround wastes is that the process unit turnarounds must be at least 2 years apart [see §61.355(b)(4)]. Obviously, averaging a turnaround waste over a long period of time (e.g., a 10-year period) reduces the facility TAB. Facilities should, however, have a good idea of when future turnarounds will take place. If a turnaround is required in 4 years instead of 10, the facility has instantly changed the divisor in the turnaround averaging from 10 to 4. Therefore, the facility could have 2 1/2 times as much annual benzene from turnaround wastes to be included in its TAB (assuming that facility generates the

same amount of waste) for each year until the next turnaround.

15. A facility has been putting wastes with greater than 10 ppm benzene into a surface impoundment. However, they plan to stop placing any benzene containing waste in this impoundment prior to April 7, 1993. Assuming that the overall facility TAB is 10 Mg/yr or greater, must this surface impoundment meet the control requirements in §61.344? Could this concept be applied more generally? If wastes are not placed in a tank (or any other waste management unit) after April 7, 1993, are the wastes in that unit subject to the rule and must the unit be controlled in accordance with the applicable requirements?

Response: First, it is important to note that the rule is a waste-based rule. That is, the applicability of the rule's control requirements is determined based on the characteristics of wastes at their point of generation. If a waste is determined to be subject to control, it must be managed in controlled units until treated.

A surface impoundment (or any other waste management unit) is not required to comply with the control requirements of the rule if no waste is placed in the unit after April 7, 1993. The control requirements in §61.344 for surface impoundments apply to "each surface impoundment in which waste is placed . . ." The language is consistent for all of the waste management unit control requirements in §61.343 through 61.347. "Placed" means placed after the effective date of the rule.

16. If a facility stops placing benzene wastes in a storage tank prior to April 7, 1993, is there a point when benzene wastes in the tank become subject to the rule? Is there a time when the wastes must be removed from the tank?

Response: As long as the wastes remain in the tank, they are not subject to the control requirements of the rule, and they can stay in the tank indefinitely without meeting the tank control requirements in §61.343. However, at the point when the tank is emptied, the waste leaving the tank may be required to be managed in controlled waste management units, depending on the characteristics of the waste as it leaves that tank.

17. Are remediation wastes received at a TSDF counted toward the TAB? Does the situation change if the remediation is performed at a petroleum refinery that has shut down?

Response: Remediation wastes generated at a petroleum refinery, chemical plant, or coke by-product plant that are

shipped to a TSDF count toward the TSDF's TAB. While §61.342(a)(3) excludes the benzene from onsite remediation wastes toward the generating facility's TAB, the section clearly states that a facility managing remediation waste generated offsite must include the benzene in this waste in their TAB.

The fact that the wastes are generated at a facility that has shut down has no effect on the TSDF's TAB determination. In §61.340(b), the applicability to TSDF is defined. This section states that Subpart FF is applicable to TSDF that "treat, store, or dispose of" waste generated by chemical manufacturing plants, coke by-product plants, or petroleum refineries and is subject to permitting under Subtitle C of the Solid Waste Disposal Act. This section does not base TSDF applicability to wastes only from operating plants.

18. If the benzene in a waste has already been counted in the TAB at the generating facility, is it not double counting to include it again when it enters the TSDF?

TAB is determined on a facility basis. Within each facility there should be no double counting of benzene. However, if the waste is transferred to another facility, or to several other facilities, the benzene is counted again each time it enters another facility's gate. The "no double counting" applies only to a given facility, and the multiple counting of the benzene as it enters another facility is intended by the rule to prevent avoidance of controls through dispersal.

19. What is the inter-relationship between Subpart FF, the hazardous organic NESHAP (HON), and other air rules that affect wastewater treatment systems?

Response: First, the HON applies to all hazardous air pollutants (HAPs) that are listed in the Clean Air Act, while Subpart FF applies only to benzene. Also, the applicability of the HON is narrower than Subpart FF. The HON is applicable to units that produce, as a primary product, chemicals that are on a specific list. The benzene waste NESHAP applies to chemical plants (SIC code 2800), petroleum refineries, coke by-product plants, and hazardous waste treatment, storage, and disposal facilities that receive wastes from one of the other three industries. Therefore, the facilities subject to the HON are a subset of those facilities subject to the benzene waste NESHAP.

In addition to the benzene waste NESHAP and the HON, EPA is developing a control techniques guidelines (CTG) document for industrial wastewater. This guidance document will be used by States to develop reasonably available control technology (RACT) regulations that will apply to chemical

plants in ozone nonattainment areas. The development of this guidance document has been done with full consideration of all HON and benzene waste NESHAP requirements.

In general, the control requirements that apply to affected wastes and waste management units are the same for all rules. The difference lies in the action level that triggers control. In other words, a facility subject to more than one of these regulations could be required to install controls on equipment under one regulation, while not under the other. However, if controls are required under more than one regulation, they should meet the requirements of all of the regulations.

In addition to control requirements, there is no desire to create an unnecessary reporting and recordkeeping burden. Facilities should work with the designated enforcement agencies to devise a recordkeeping system that satisfies all regulations.

Since the HON has been proposed and not yet promulgated, facilities have the opportunity to comment on the HON's proposed wastewater requirements. The EPA would appreciate hearing from industry if they believe significant inconsistencies exist between the HON and the benzene waste rule.

20. Based on EPA's broad definition of "waste" under this rule, wouldn't products and intermediates also be considered wastes?

Response: A material is classified as a waste if it is discarded or "accumulated, stored or treated prior to being discarded, recycled, or discharged." Products and intermediates are not covered under Subpart FF. There are areas of the rule that may cause confusion, but this should not be one of them.

21. If a process change is made that reduces waste quantity, can the latest waste rate be used rather than the highest previous 5 years, or design capacity?

Response: Section 61.357(a)(4) states that the information contained in the initial and annual reports, including the TAB, should be based on "current configuration and operating conditions. Section 61.355(b)(5) through (7) provide the methods by which the annual waste quantity must be determined, with paragraph (5) referring to use of data from the highest previous 5 years and paragraph (6) referring to the maximum design capacity. Paragraph (7) also allows the use of measurements that are representative of maximum waste generation rates. Therefore, measurements taken after the process modification could be used to determine the annual

RCRA definition?

Response: No. The owner or operator should seek guidance from the Agency in situations where the meaning of a term in the regulation is unclear.

31. Can you generate knowledge of the waste after March 1990?

Response: Yes. A new 90-day report is required by April 7, 1993. If a source has new additional information since the last report, it can be used at this time.

32. If a source has tests that do not meet EPA protocols prior to 1993, can they be used as knowledge of the waste?

Response: Yes. Any information that is documented and reasonable is acceptable for use in determining TAB based on knowledge of the waste.

33. How does the rule affect a facility if it closes and then several years later performs remediation?

Response: Benzene contained in remediation wastes is not included in TAB. Remediation wastes with benzene concentrations greater than 10 ppm do have to be managed in controlled units if the facility has a TAB greater than 10 Mg/yr. However, if the facility is closed, then the TAB would not be greater than 10 Mg/yr and it would not be affected by the rule.

CONTROL AND TREATMENT REQUIREMENTS

1. EPA clarified the definition of "water seal controls" for sewer lines by adding other examples of acceptable control equipment, such as flooded sewers and baffle plates on junction boxes. The preamble also states that "the control specified for drains and junction boxes in an individual drain system is to isolate them such that the free flow of vapors within the system is prevented." If a junction box is equipped with water seal controls, then does this clarification mean that the small flow of air/vapors from a junction box vent, which is caused by temperature change (such as diurnal temperature changes) or barometric pumping (resulting from changes in atmospheric pressure), or minor level changes in the water level in the junction box, is acceptable and that additional controls on the junction box vent are not necessary, even if a small flow is detected per §61.346(b)(2)(ii)(A)?

Response: According to the rule, the junction box must be vented to a control device if the flow indicator shows that vapors are vented to the atmosphere during normal operation.

The EPA's intent was to control emissions from the free flow of vapors in the collection system and from working losses as the vessel is filled and then emptied. There was no intent to require vent controls for breathing losses (e.g., from diurnal temperature changes). However, if the device is not operated at a constant liquid level and undergoes cycles of filling and emptying (even with minor changes in the water level), the flow could be significant (for example, the volume of vapor pushed out of the vent could equal the volume of wastewater entering the junction box.) The burden is on the owner or operator to show that there is no flow through an uncontrolled junction box vent, or if there is flow, that it did not occur during normal operation.

2. A refinery has installed above ground water seals on their oily-water sewer drains that utilize an under-over weir system, part of which is comprised of a removable cover. During normal operations, the water seal is always present. However, it is sometimes necessary to drain a vessel to the sewer. To do this with the cover in place could cause the weir system to over-flow to the surface, creating a safety hazard. Therefore, it is current operating procedure to remove the cover when draining large amounts of material to the sewer, replacing it afterwards, and replenishing the water seal. Does EPA see a problem with this procedure? Since this is done on an infrequent basis, is it necessary to log the amount of time that the water seal is breached? It would certainly be less than would occur if the seal were to go dry and no different than draining to a drain with a p-leg in it.

Response: The gist of this question is whether the rule allows the cover to be removed and the water seal to go dry temporarily and infrequently to drain a vessel and to avoid creating a safety hazard. The rule allows the cover to be removed if it is necessary to use the opening for waste sampling or removal and for equipment inspection, maintenance, or repair. There are no conditions given in the rule under which the water seal would be allowed to go dry. However, if the facility shows that the operation described above is the most practical and safest way for draining the vessel and that any emissions that result would be minimal (i.e., not different from those generated by draining to a drain with a p-leg in it), the procedure may be acceptable to the applicable enforcement agency.

3. Are there specific benzene recovery units that have been approved by the EPA and is an approval process necessary? If so, what specific EPA office would provide approval?

Response: No, specific units are not approved by the EPA for the recovery of benzene from wastes, and an approval

process is not necessary. If the unit is used for treatment under §61.348 (Treatment Processes), then the unit must meet the treatment requirements of the rule (99 percent removal or destruction of benzene or an outlet concentration less than 10 ppmw without the aid of dilution). The treatment requirement is a performance standard and not a technology standard; consequently, the owner or operator may choose any benzene recovery process that meets the performance standard, and EPA approval is not required.

However, if the question is also directed toward units that are used to control benzene air emissions by recovering the benzene from vented vapors, the unit must meet the requirements for control devices (§61.349 - Closed-vent systems and control devices). In general, the control device must meet either performance standards (95 percent control of organics or 98 percent control of benzene) or certain design and operation parameters that are given for specific types of control. If a vapor recovery system other than those described in the rule is used (condenser or carbon adsorber), the owner or operator must submit to the Administrator (i.e., appropriate regional office or delegated State agency) test data and their proposed monitoring of operation or performance. The Administrator will approve or disapprove the use of the unit based on the information submitted. The unit may be installed and used prior to approval; however, if the unit is subsequently disapproved, the facility may be subject to a determination of noncompliance.

4. Typically, small (less than 2,500 gal in size) organic waste tanks have 3-in vents that handle the "breathing" of the tank as it fills and empties. Do the new regulations [§ 61.343(b)(3)] require water seal controls or another device such as a safety valve on the 3-in vent, or are the regulations referring to only a device (e.g., a safety valve) on the tank to protect it from physical damage or permanent deformation?

Response: The rule requires a device on the vent that opens only during normal operation (e.g., a conservation vent that opens at a low pressure or vacuum) to prevent damage to the tank from filling or emptying, diurnal temperature changes, atmospheric pressure changes, or malfunctions. The intent of this requirement was that the tank could be vented to the atmosphere under the conditions described above; however, it could not be vented directly to the atmosphere if the tank were aerated or heated and vapors were driven from the tank. A water seal in the vent is definitely not required by the rule and is not recommended.

5. If a closed-vent system contains a bypass line that could divert a vent stream away from a control device,

§61.349(1)(ii) requires that a flow indicator be installed that provides a record of vent stream flow away from the control device in this bypass line. As an alternative to installing a control device, §61.349(1)(ii)(B) allows a facility not to install a flow indicator if the bypass line is secured in the closed position with a car-seal or a lock-and-key type configuration. Are there alternatives to these provisions that are allowed?

Response: The intent with the car-seal requirement is that an inspector can easily determine if the by-pass line had been opened. Section 61.14(g) of the General Provisions to Part 61 does allow alternative monitoring procedures. If a case was made that certain equipment or a procedure was equivalent to or better than the car-seal or lock-and-key configuration, it is possible that the enforcement agency could approve the alternative procedure. To say that a system is equivalent, there would have to be a record to show that the valve had been opened and closed. This record would need to be something that could be reviewed at a later time, as opposed to an instantaneous alarm. Such a situation could probably be approved by the local or State agency, but may be reviewed by EPA if there are questions. However, since it is only a minor modification, it probably would not need to go through a full rulemaking.

6. The hazardous organic NESHAP (HON) has a provision similar to the benzene waste NESHAP that requires a flow meter, car-seal, or lock-and-key type configuration for each closed-vent system by-pass line. However, the HON exempts from these requirements low-leg drains, high-point bleeds, analyzer vents, and open-ended valves or lines that are subject to applicable provisions in the HON. Does this rule contain the same exemptions? Also, could the rule contain an exemption for small connections, such as 1/4 inch bleed valves?

Response: The benzene waste NESHAP does not specifically list the exemptions contained in the HON. Comments were received on this issue, and EPA addressed this issue in the preamble to the final regulation (58 FR 3081). EPA stated in the preamble, "Opening of low-point drains as described by the commenter would also be allowed as long as the drain does not permit diversion of the vent stream away from the control device." There are no provisions in either the benzene waste NESHAP or the HON for a size cutoff for by-pass lines.

7. When must benzene-containing wastes at TSDF be controlled?

Response: Wastes that are identified by the generator as requiring control must be controlled by the TSDF. In addition, if the TAB at the TSDF is 10 Mg/yr or more,

hazardous wastes generated by the three affected industries or wastes derived from them may be subject to the control requirements (e.g., if the wastes contain at least 10 ppm benzene and do not qualify for an exemption).

8. A facility has a redundant control system in which a condenser is followed by an incinerator, which is backed up with a flare. The facility monitors the condenser temperatures to meet the requirements of the rule. However, if the condenser fails or is taken out of service, the incinerator becomes the primary control device. What are the monitoring requirements for this situation? Do both units have to be monitored at all times?

Response: In general, the control device's parameters that must be monitored are established through a performance test or engineering calculations and are correlated to a certain emission control efficiency for the control device. For example, if the facility is reporting the temperatures associated with the condenser to comply with the rule, and it is subsequently taken out of service, the incinerator becomes the control device. In this case, the temperature (or other appropriate parameter) that must be monitored is based on the second control system (the temperature of the incinerator). If both of these units are identified as devices that are used to meet the control requirements of the rule (e.g., to meet the control efficiency requirements), the facility should monitor both devices.

However, if the facility establishes that the second control device (incinerator) would meet the control requirements of the rule even if the first unit failed, then the temperature of the incinerator could be monitored instead of the temperature of the condenser. In this case, the incinerator is monitored because it is the control device that ensures that the control requirements of the rule are met. The facility should submit details of their proposed monitoring for this type of system in their compliance plan to the region or delegated State agency.

9. What are the control requirements for tars and sludges that contain over 10 ppm benzene, which are put into 55-gallon drums that are subsequently landfilled?

Response: If the containers are filled by pumping, then submerged fill must be used for loading them. At other times, the containers must be covered. There are no control requirements under the benzene waste NESHAP after the drums are landfilled if the disposal of these wastes meets the benzene-specific treatment standards under the Land Disposal Restrictions (40 CFR Part 268). The intent was that compliance with hazardous waste regulations and effluent guideline limitations (wastewater regulations) would be

considered as compliance with the benzene waste NESHAP, provided any treatment units that are used prior to disposal or discharge are controlled for air emissions.

10. If a phase separation occurs in a container, does that make the container an oil-water separator that is subject to the oil-water separator provisions?

Response: This is not EPA's intent. An oil-water separator is a permanent tank or tank-like facility that is designed and operated to separate oil from water. A unique aspect of the oil-water separator provisions is that many use ancillary equipment such as forebays, sludge hoppers and skimmers, which are considered as part of the oil-water separator under the definition in the rule. A container in which a phase separation occurs does not have these kinds of emission points. The EPA's intent under the oil-water separator provision is to control both the separator unit and its ancillary equipment.

11. Typically during a process unit turnaround, the vessel is first drained to process storage or another process unit. Then the vessel is steamed out and vapors are vented from the vessel to a flare. At this point, the unit is at greater than atmospheric pressure. After steaming, the vessel must be vented to the atmosphere. Under the rule, would those vapors vented to the atmosphere be excluded gases and vapors?

Response: Yes.

12. A closed vent system at a facility serves several process units, but only that part of the system closest to the control device manages vent streams containing benzene vapors subject to Subpart FF. Is the entire closed vent system subject to Subpart FF, or is only that part managing vapors that require control under the rule subject to Subpart FF?

Response: That portion of the closed vent system that manages the vent streams requiring control under the rule and the control device are subject to Subpart FF's requirements for closed vent systems and control devices. This would include all vent piping from the unit that is required to be controlled up to and including the control device. That portion of the closed vent system that manages only vapors not required to be controlled under the rule is not subject to Subpart FF.

13. A facility treats a waste stream and removes 99 percent of the benzene, but the treated waste still contains over 10 ppm benzene. Is the treated waste a "new" waste that requires control or additional treatment because it has over

10 ppm benzene?

Response: No, the rule does not require controls or additional treatment for the treated waste because 99 percent of the benzene has been removed from the waste. The treatment provisions in § 61.348(a)(1) require either treatment to less than 10 ppmw benzene, removal of 99 percent of the benzene, or at least 99 percent destruction of the benzene in the waste by incineration.

14. A facility has a process sewer that is subject to the control requirements of Subpart FF and a storm sewer that does not manage wastes containing benzene. The storm sewer is combined with the process sewer in the plant's wastewater collection and treatment system. What controls are required for the storm sewer?

Response: A water seal must be installed on the storm sewer where it combines with the process sewer to prevent the flow of vapors from the process sewer to the storm sewer. If the storm sewer is isolated in this manner and no benzene wastes are managed in the storm sewer, no additional controls are required for the storm sewer.

15. A facility plans to comply with the compliance alternative of treat to a target benzene quantity of 6 Mg/yr. Parts of the existing wastewater collection and treatment system that manage process wastes will be controlled and hardpiped to an enhanced biodegradation unit. Certain waste streams (e.g., storm water and miscellaneous small streams) will be collected and managed in units not controlled for air emissions, and then will be mixed in hard piping with the process wastes described above before entering the enhanced biodegradation unit. Before mixing, the process wastewater that is controlled contains over 10 ppmw benzene and the wastewater that is not controlled contains less than 10 ppmw. After mixing the combined waste stream contains less than 10 ppmw benzene but has over 1 Mg/yr of benzene. The mixed stream with less than 10 ppmw benzene enters the enhanced biodegradation unit. Where is the benzene quantity for the compliance option (treat to a target) calculated, is the enhanced biodegradation unit exempt from controls, and is this considered dilution under the rule?

Response: The system as described is not considered to be dilution to avoid the rule's control requirements. The prohibition against dilution is to meet the treatment requirement of 10 ppmw benzene. The example described above would be considered mixing to facilitate treatment in the existing wastewater system. The benzene quantity for the waste streams that are not controlled must be determined at their point of generation. The benzene quantities for the process wastes that are controlled throughout the collection

and treatment system are not counted if the benzene concentration of the stream entering the enhanced biodegradation unit is less than 10 ppmw. The quantity of benzene entering the enhanced biodegradation unit does not matter under the rule; consequently, it is not relevant that the combined stream contains over 1 Mg/yr benzene. As described, the enhanced biodegradation unit would not require controls under the rule.

COMPLIANCE ALTERNATIVES

1. If the 2 Mg/yr exemption is used, what will be acceptable controls when drawing tank water bottoms, i.e., person standing next to tank? What type of documentation is acceptable, i.e., annual sampling, beginning-middle-end of each draw, etc.?

Response: The recordkeeping requirements are given in §61.356(b)(2)(ii) and the reporting requirements are found in §61.357(d)(3). Documentation is required for all waste streams used for this exemption. Acceptable controls for this case are to be determined by the company; however, the level of scrutiny of the documentation for compliance determinations will likely be a function of the quality of the documentation. For example, documentation based on sampling and analysis of several drawdowns from representative samples (including layers of water, emulsion, and organics that represent the waste as a whole) would likely be judged more reliable than using either a few samples or knowledge of the waste for the documentation. In addition, a facility would need to document the operational procedures and controls in place to ensure that the conditions used during the determination are consistent. This could also include records of occurrences and details of each drawdown.

2. For a facility subject to the control requirements, what will be required when a new waste (i.e., one that was generated for the first time subsequent to 01/07/93) is generated?

Response: If the total annual benzene quantity is equal to or greater than 10 Mg/yr (i.e., the facility is subject to the control requirements of the rule), any waste generated during the year is subject to the control requirements of the rule once it is generated. If a facility previously had a TAB less than 10 Mg/yr and the new waste made the facility TAB equal to 10 or greater, all waste streams at the facility would now be subject to the control requirements, depending on their composition. A regulatory status report would have to be submitted immediately to the regulatory agency and controls installed. If a facility previously had

a TAB less than 1 Mg/yr and the new waste caused the TAB to be 1 Mg/yr or greater but less than 10 Mg/yr, an updated regulatory status report is required. In addition, annual updates are also required.

3. Is the risk assessment compliance alternative useable in combination with various control alternatives?

Response: No. If the site-specific risk alternative is promulgated, the owner or operator will not be allowed to use the other alternative compliance options that now exist, (i.e., 6 BQ and 2 Mg/yr exemption). The site-specific risk option would, however, allow flexibility in deciding which waste streams and waste management units to control.

4. For a facility covered by the rule, are organic wastes (recovered hydrocarbons) which were not used in calculating the total annual benzene (TAB) subject to controls?

Response: Yes.

5. If a facility is complying using the 6 Mg/yr BQ alternative, how is the benzene quantity determined for wastes entering enhanced biodegradation units? In determining the BQ at an enhanced biodegradation unit, is the benzene content determined in the effluent or the influent?

Response: Section 61.355(k)(4) of the rule contains provisions for calculating the benzene quantity for wastes entering an enhanced biodegradation unit. Basically, it says that the benzene in wastes entering an enhanced biodegradation unit does not have to be included in the BQ (i.e., is counted as zero), if the following conditions are met: 1) the benzene concentration for each stream entering the biodegradation unit is less than 10 ppm, and 2) all prior waste management units in which wastes are handled are controlled in accordance with the rule. Another important criteria is that the biodegradation unit must meet the definition of an enhanced biodegradation unit [as defined in §61.348(b)(2)(ii)(B)]. If these criteria are met, the benzene in the effluent from a biodegradation unit is not counted, even though there may be benzene present.

6. Example: At a facility complying under the BQ option, a waste that is not managed in controlled units is combined with other wastes, that have been managed in controlled units from their point of generation. This combined stream, containing less than 10 ppm benzene, is then managed in controlled units all the way to an enhanced biodegradation unit. How should the benzene be counted for the BQ determination?

Response: The benzene contained in the "uncontrolled" waste

must be included in BQ at its point of waste generation, or at the point where it enters the first uncontrolled unit. Since the other wastes are controlled from their point of generation all the way to the enhanced biodegradation unit, and the stream entering the unit contains benzene in quantities less than 10 ppm, the provisions of §61.355(k)(4) apply (i.e., the controlled wastes do not add additional benzene to the BQ).

7. For the target BQ option, where is the benzene quantity determined when the first uncontrolled unit is offsite?

Response: If the facility is not using the offsite facility for treatment to lower the BQ, the determination is made as the waste leaves the generating facility. If the offsite facility is treating the waste to lower the BQ, the benzene quantity determination is made after controlled treatment and prior to entering the first uncontrolled unit. In this case, documentation of such treatment must be provided that includes evidence that units prior to treatment are controlled.

8. A facility that is planning to comply with the 6 BQ alternative has a surface impoundment that has not received wastes in many years. Sludges are moved around the bottom of the lagoon to facilitate drying before being bioremediated. Under the 6 BQ alternative, benzene remediation wastes must be counted toward the 6 Mg target. Would this moving of wastes constitute a situation where the benzene in the waste would need to be included in the BQ?

Response: The fact that the materials/sludges are or are not remediation waste does not appear to be a critical point in this particular case. The surface impoundment clearly contains a waste material; this material is currently being managed/treated in a waste management unit. The preamble to the rule states that "the benzene in all materials that meet the definition of waste in the rule and that contain 10 percent or more water (or that are combined with other streams such that they contain 10 percent or more of water) must be included in the target benzene quantity determination except for those materials exempted from all aspects of subpart FF in §61.340(c)." The target benzene quantity is calculated by summing the mass of benzene in all waste streams managed in units that do not comply with §§61.343 through 61.348(a). The mass of benzene is determined at the point of generation for a waste stream if the first unit in which the waste is managed is not equipped with air emission controls as specified in the rule. In the given situation, the point of generation is a waste management unit, the surface impoundment. Movement of the sludges would be considered waste generation and the quantity of benzene in the sludge would need to be included

in the BQ.

9. Can a refinery that has achieved compliance by April 7, 1993, using the basic control approach, later switch to the site-specific risk compliance option, if it becomes available?

Response: Yes. Once a facility chooses a compliance option it is not bound forever to that option. However, a facility that is in compliance by April 7, 1993, cannot later apply for a waiver of compliance to utilize the site-specific risk option, if it is promulgated. If a facility changes its compliance approach, the appropriate enforcement authority must be notified of any change in a compliance option.

10. Are fugitive emissions of benzene included in the BQ? If so, do you only count the waste operations fugitives or do you also include the process unit fugitive emissions?

Response: Like the TAB, the benzene quantity (BQ) accounts for benzene in aqueous wastes (and wastes that become aqueous). BQ is not a measure of air emissions, therefore air emissions from fugitive or any other source, are not included in the determination.

11. How do you control organics in turnarounds under the BQ option?

Response: At a facility complying with the 6 Mg/yr BQ alternative, all organic wastes containing 10 ppm benzene or greater must be managed in controlled units in accordance with §61.343 - 347, and treated in accordance with §61.348. The BQ alternative allows flexibility in determining which aqueous streams are controlled. However, there is no flexibility in the 6 Mg/yr BQ alternative (or any other alternative) with regard to organic wastes.

12. Can you change the waste streams selected for exemption under the 2 Mg exclusion on a year to year basis?

Response: Yes. However, it is critical that adequate documentation is provided to demonstrate compliance. Annual reports must clearly identify streams exempted under the 2 Mg/yr exemption.

13. Do you need to include turnaround waste in the 6 BQ?

Response: Yes, if the turnaround waste has a water content greater than 10 percent, the benzene in the turnaround waste must be included in the BQ. For the purposes of the benzene quantity, turnaround wastes are treated no differently than other wastes. If the turnaround waste are not being treated and managed in controlled units, the benzene at the point of

generation is included in the BQ. If the turnaround waste is being treated, the BQ should be determined after treatment. If the turnaround waste is managed in controlled units and then discharged from the facility, the BQ is determined at the point it leaves the facility. In addition, credit for offsite treatment can be taken for turnaround wastes with the proper documentation. A final note: the benzene in turnaround wastes must be included in the BQ for the year it is generated. Averaging of turnaround waste benzene is allowed only for TAB, and not for BQ.

14. If you are doing a series of turnarounds with different process units, can some be included in the 2 Mg/yr exemption and others averaged?

Response: Yes, you can elect to average some of the units for turnaround and with others use the 2 Mg/yr exemption.

WAIVER GUIDANCE

1. If a facility is not in compliance by the April 7, 1993 deadline, but has submitted a waiver application prior to that date, is the facility considered to be in compliance if the waiver has not been approved by April 7, 1993? If so, is there a possibility of obtaining a conditional approval or some other mechanism to cover the facility pending final action by EPA on the waiver application?

Response: Section 112(c) of the Clean Air Act requires that no hazardous air pollutant be emitted from any stationary source subject to a NESHAP in violation of that NESHAP. As such the EPA is not authorized to grant "conditional waivers", "no action assurances", or "shields" from a finding of non-compliance. An affected source must meet the requirements of Subpart FF or have an approved waiver application on April 7, 1993. Any source that does not meet one of the above conditions may be found to be in non-compliance with the NESHAP as promulgated on January 7, 1993. The final determination of compliance status is made by the enforcement agency. The enforcement agency cannot decide on the legitimacy of a waiver request until the application is reviewed. However, the EPA will inform and train the enforcement people who are responsible for implementation of the rule. In addition, the EPA has prepared and distributed a guidance document that describes the procedures and conditions for obtaining approval of a waiver request. The enforcement agency can issue a letter or provide documentation that a waiver was received and that the facility made a good faith effort to submit the waiver request in a timely manner. Historically, enforcement discretion has been used in similar situations and determinations of non-compliance have not been made.

2. What happens to the waiver requests once received by the EPA regional offices?

Response: The applicable enforcement agency will acknowledge receipt of the waiver application and review the application to confirm the calculations, the appropriateness of the proposed mitigating actions, and adequacy of the benzene waste operations emissions control compliance strategy. The owner/operator of the facility is fully responsible for providing the necessary information to the EPA or delegated agency and demonstrating the need for a waiver. If a facility provides insufficient or ambiguous information, the EPA, or delegated agency, will ask the facility owner/operator to provide the needed information and allow the owner/operator a reasonable time to provide additional information substantiating the waiver request.

An owner or operator will be notified prior to the denial of a waiver request and given an opportunity to present additional information or arguments before a final determination is made. A final determination to deny a waiver will be in writing and set forth the specific grounds on which the denial is based. The final determination will be made within 60 days after presentation of additional information, or within 60 days after the final date specified for the presentation if no presentation is made.

3. If a facility expects to comply with the site-specific risk assessment option to be proposed by EPA, why are offsets required if that facility can demonstrate (through modeling) that there are no risks associated with benzene waste operations to the nearest neighbors $> 1 \times 10^{-5}$?

Response: As stated in the waiver guidance document, one of the goals of the waiver policy is to obtain mitigating environmental benefits to compensate for benzene emission reductions lost as a result of delayed compliance (original compliance date of March 7, 1992). This policy goal will be applied to waiver applications independent of the compliance approach that is chosen. Consequently, if a waiver is needed for compliance with Subpart FF as amended January 7, 1993, facilities must compensate for the benzene emissions lost due to delayed compliance with Subpart FF. Mitigation goals and credits under the waiver policy must be calculated based on a plan to comply with Subpart FF as amended on January 7, 1993. Another consideration is that the promulgation of the site-specific risk assessment alternative compliance option is not certain as the option must go through the entire rulemaking process (i.e., EPA review, proposal, comment period, and final administrative review). In addition, the acceptable level of risk for the alternative compliance option has not been determined to be 1×10^{-5} as suggested by the question. A risk level of

1 x 10⁴ has been suggested by some industry representatives; this level along with others is being considered by the EPA.

4. Under the waiver plan it appears that a refinery has the option of not initiating recordkeeping and reporting until the facility has completed all aspects of its compliance plan and can certify that all of the hardware is in place for compliance. Is this EPA's intent or does EPA intend to ask for recordkeeping on individual segments as these controls are installed?

Response: Any waiver issued by the EPA or the delegated agency will specify conditions that the Administrator determines necessary to ensure protection of public health during the waiver period. The applicable reporting requirements for the NESHAP will not be waived. The waiver conditions should include a requirement for reporting and owner/operator certification on a regular basis to ensure the facility is complying with the conditions of the waiver agreement. The EPA is recommending quarterly reporting during the waiver and mitigation period; however, State and local agencies may require other periods. [Waiver Guidance Document pg. 5-4]

5. In developing offsets for the waiver application, what is the earliest date that can be used for calculating emissions generated from unit shutdowns? Can emissions from a unit generating benzene waste streams that was shutdown prior to March 7, 1990 be used as reductions in the waiver application?

Response: Emission reductions resulting from shutdowns or downsizing of production or waste management units, whether permanent or temporary, will not be allowed as credit for mitigating actions. Credit for allowable mitigating actions may begin as of March 7, 1992.

6. What are the acceptable methods for estimating emissions from waste collection systems (i.e., sewers, drains, manholes, junction boxes) and from wastewater treatment plants (i.e., ponds, oil water separators, dissolved air flotation units, etc.)? Can you provide examples?

Response: The emissions from the wastewater system, including both collection and treatment units before controls are installed, are estimated as 72 percent of the benzene quantity entering the collection system if the oil-water separator is not covered and as 47 percent of the benzene if the oil-water separator is covered. Additional details on how to estimate emissions are provided in the Waiver Guidance document Appendix A, "Procedures to Determine Benzene Emissions from Waste Operations." References 2, 3, and 5 in that appendix provide information

on the development of these procedures to estimate emissions.

7. A facility has been putting wastes with benzene contents greater than 10 ppm into a surface impoundment. However, they plan to stop placing any benzene containing waste in this impoundment prior to April 7, 1993. Since benzene emissions would be occurring from the impoundment even though no material was being added, would these emissions need to be offset if the facility was obtaining a waiver?

Response: Since the surface impoundment would not be subject to the rule, emissions from this surface impoundment would not have to be offset in the waiver application.

8. A facility is taking two tracks - they are making efforts to come into compliance and also obtaining mitigating actions. After they have met the mitigation goal they still have the equipment in place and are still getting emission reductions. Can they receive additional credits?

Response: No.

9. If you take actions under 33/50 can you receive credit, and when do these count?

Response: Credit would begin with the original benzene waste operations NESHA compliance date of March 1992 and can be carried through March 1997.

10. If a source is in a non-attainment area and is planning to go beyond the standards required for non-attainment areas, can this be used for mitigation credits?

Response: Yes, if there is a corresponding emission reduction from these actions, assuming that it is not subject to the NESHA.

MONITORING, REPORTING, AND RECORDKEEPING

1. How is the reporting year defined (e.g., calendar year, April 7, 1993 - April 7, 1994) for such calculations as Total Annual Benzene (TAB), Benzene Quantity (BQ), and for 2 Mg/yr small quantity exemptions?

Response: Section 61.357 paragraphs (a) and (d) require that the initial report be submitted no later than April 7, 1993. The annual waste quantity reported in this initial report is to be based on the maximum waste generation rates as determined by 5 years of operating data, maximum design capacity, or other means. Thus, there is no specific reporting period for the initial report due April 7, 1993.

Data should be representative of current operations for the relevant reporting period.

The subsequent annual reports must cover 12 consecutive months. The report to be submitted by April 1994 may cover calendar year 1993, even though controls are not required prior to April 7, 1993. However, as noted in the question, this could present problems if a facility is complying with the 6 Mg/yr treat to a target BQ alternative, or using the 2 Mg/yr exemption with the basic control alternative. Owners or operators who choose to use the 6 Mg/yr BQ alternative or the 2 Mg/yr exemption may find it advantageous to utilize a reporting period of April 1993 to April 1994 for the first annual report to demonstrate compliance with these provisions. However, the April 1995 report could utilize calendar year 1994 for the reporting period, with subsequent reports on a calendar year basis thereafter. It is important to note that the reporting period may be specified by the appropriate regulatory agency and, if the reporting period is changed, there should be no lapse in the reporting during the transition. The EPA does not intend to issue guidance on this subject.

2. What is the requirement for monitoring to ensure that the 6.0 Mg/yr limit is met under the BQ alternative compliance option or the 2 Mg/yr exemption under the rule?

Response: There is no additional monitoring provision under §61.354 (Monitoring of operations) for either the 6.0 Mg/yr limit or the 2 Mg/yr exemption. However, provisions in the recordkeeping and reporting sections require documentation for these options. For the 2.0 Mg/yr exemption under §61.342(c)(3)(ii), the recordkeeping requirements of §61.356(b)(2)(ii) and the reporting requirements of §61.357(d)(3) apply. For the 6.0 Mg/yr treat to a target benzene quantity, the recordkeeping requirements of §61.356(b)(4) and the reporting requirements of §61.357(d)(5) apply. The reporting provisions require an annual determination, which should be representative of normal operations. The number of samples (or other types of determinations) to be used should be based on the particular unit. For example, if the waste from the unit does not vary over time and the facility can make a good case for this, an evaluation once per year or less should be sufficient. If it is variable, the variability should be accounted for in the determination. In addition, the enforcement agency can request that sampling and analysis be performed at any time to verify the reported benzene quantity.

3. Immediately upon startup of a new source, a number of certifications, reports, and inspections are to be completed. This is not always possible, since some of the items require operation of the unit. Could the due date for

these items be changed to 90 days after the startup of a new source?

Response: Under §61.05 of the General Provisions, no owner or operator shall operate a new stationary source subject to a standard in violation of that standard, except under an exemption granted by the President. One reason for this requirement is that owners or operators normally have long lead times prior to the startup of a new source in which to obtain sufficient information for the startup.

4. Explain what a facility can do if it has duplicative requirements under the benzene waste NESHAP (Subpart FF) and the New Source Performance Standard for wastewater treatment systems at petroleum refineries (Subpart QQQ of Part 60).

Response: If a facility is subject to two standards, it cannot substitute one for the other. In other words, the benzene waste NESHAP does not replace the NSPS QQQ. To the extent the two standards are duplicative in their recordkeeping and reporting requirement, a facility could substitute one report for another and fulfill both requirements. A facility, however, cannot replace a report required under one rule for another type of report required under the other rule. To the extent that the requirements are not duplicative, the source remains subject to both regulations. There may be cases in which the enforcement agency might consider a single report adequate if it meets the requirements of both rules. With respect to control requirements, controls that are acceptable under Subpart QQQ are generally also considered to be acceptable controls under the benzene waste NESHAP.

5. Can the carbon adsorption monitoring requirements under Subpart FF be substituted for those under NSPS QQQ?

Response: Section 60.695(a)(3) of Subpart QQQ requires continuous monitoring of the exhaust gas from carbon adsorbers. Paragraph (c) of that section allows an alternative parameter to be monitored if it is demonstrated that such monitoring will ensure the adsorber is operated properly. Alternative methods of monitoring under the benzene waste NESHAP may be allowed at the discretion of the enforcement agency if a demonstration is made that the alternative is equivalent to or better than the required monitoring. Consequently, the monitoring requirements of one rule cannot be automatically substituted for those required under another rule without approval of the enforcement agency.

6. A facility made up of several process units is subject to the control requirements because of the TAB calculated for specific process units that use benzene. Some (most) of the

process units in the facility do not contain benzene except at perhaps trace levels and these process units do not have wastes that contain ≥ 10 ppm benzene. What is required in these process units? Are records of all wastes in these units required?

Response: Yes, records are required for any wastes that contain benzene and are managed in the unit to determine TAB and to demonstrate that these wastes contain less than 10 ppmw benzene. However, this does not mean extensive sampling and analysis must be performed or that extensive records are required. Other procedures that are available include knowledge of the waste, which could be based on historical data, engineering principles, or other information.

In general, the owner or operator does not have to control waste streams that contain less than 10 ppmw benzene (unless it is by choice under the "treat to a target" benzene quantity of 6 Mg/yr). Consequently, the process units would not require controls under this rule.

7. Are small containers covered by the container standards, or is there a minimum container size that would be affected by the rule? If lab samples of process material with 10 ppm or more benzene are poured down a drain, where is the TAB determined and how is double counting avoided? If the small benzene quantity exemption cannot be used because the "treat to a target benzene quantity" option is used, must all of these small containers (such as samples) be monitored ("sniffed") and records kept? If so, this requirement would be unnecessarily burdensome because of the large number of small containers that on the whole have only a very small quantity of benzene.

Response: There is no de minimis level or size cutoff for containers. However, the benzene in these containers can be exempted from the control and monitoring requirements under the small benzene quantity exemption of 2 Mg/yr. If the "treat to a target" option is chosen, wastes that contain more than 10 percent water and are managed in containers may be exempted from the control requirements if their benzene quantity is included in the calculation to compare with the 6 Mg/yr limit. However, wastes that contain 10 percent or less water, have 10 ppm or more benzene, and are kept in containers under this compliance approach ("treat to a target") are subject to the rule's control, monitoring, and recordkeeping provisions. Under both the small quantity exemption and the "treat to a target" option both the recordkeeping and reporting provisions apply.

8. If a facility knows that it is above the 10 Mg/yr TAB limit and also knows that it will always be above 10 Mg/yr, why

does the facility have to go through the exercise of reporting each waste stream and its TAB calculation every year?

Response: The report is an essential tool for enforcement personnel to assess compliance status. The annual report requires that every benzene-containing waste stream be identified individually, along with the waste quantity, benzene concentration, the benzene quantity for aqueous wastes, and how each waste stream subject to the control requirements will be managed to comply with the rule. If there are no significant changes from year to year, little effort would be required to copy the previous report and identify any changes. Note that determinations of waste quantity, benzene concentration, and benzene quantity are not required every year if there are no changes. There should be more certainty in the determinations for the waste streams that will not be controlled than for those that will be controlled.

9. If a chemical manufacturing plant does not have benzene at the facility, must it submit a 90-day report?

Response: All chemical manufacturing plants (SIC code 2800) must submit the 90-day initial report no matter what their TAB level is (even zero). For the case of no benzene, the report can merely state that there is no benzene or benzene waste at the facility. The regions will be looking for reports from all affected facilities, including all chemical manufacturing plants.

10. What is meant by certification that the required equipment is in place?

Response: A certification is a signed statement by a responsible official that the controls required by the rule have been installed and that the required initial inspections or test have been carried out in accordance with the rule.

11. Do the reporting requirements in the General Provisions (§ 61.10) apply?

Response: Yes. The General Provisions apply unless they are overridden in a specific rule. The referenced section of the General Provisions was not overridden for the benzene waste NESHAP.

12. When controls such as condensers and incinerators are used to control benzene emissions, does the source need to do a stack test to demonstrate the removal efficiency?

Response: Section 61.356(f) contains the recordkeeping

requirements for closed vent systems and control devices. This section requires documentation of the performance level of the control device, which may be in the form of design specifications, or a source test. However, EPA can require the facility to perform a source test if the performance levels are questionable.

13. When are the quarterly reports required under §61.357(d)(6) and (7) and (g) due?

Response: The first quarterly reports for these sections, which deal with inspections and deviations from the rule, are due July 7, 1993.

14. Is it possible for a facility to ask the applicable enforcement agency for a change in the reporting date?

Response: Yes, the facility may request approval from the enforcement agency for a variation on the due dates for annual and quarterly reporting; however, there must be no lapse in the frequency of the reporting nor can there be any time period that is not accounted for in the reporting period.

15. Are onsite TSDF included in monitoring and recordkeeping requirements since the waste is generated onsite?

Response: All provisions of Subpart FF apply to owners and operators of hazardous waste TSDF that treat, store, or dispose of hazardous waste generated by petroleum refineries, chemical manufacturing plants, or coke by-product plants whether the TSDF is located onsite or offsite.

MISCELLANEOUS

1. On page 3075 of the preamble to the January 7, 1993 final rule, EPA clarifies that the rule does not apply to the act of excavating contaminated media in remediation activities, but such waste must be handled and treated in accordance with the provisions of the rule. This could require that contaminated dirt from a petroleum spill be subject to the rule's treatment requirements if the excavated soil contains more than 10 ppmw of benzene. This seems directly opposed to EPA's December 24, 1992 proposal to suspend applicability of the Toxicity Characteristic (TC) rule to non-underground storage tank (non-UST) petroleum contaminated media for 3 years, as benzene extraction is the most likely reason for TC test failure of such media. If the EPA intends to grant some relief in this area, please explain how a refinery can avail itself to this relief in light of the January 7, 1993 benzene NESHAP.

Response: No relief is planned. The rule requires that remediation waste with 10 ppmw or more benzene be controlled and treated for removal or destruction of the benzene if the facility exceeds the TAB cutoff of 10 Mg/yr.

2. Are there any restrictions on the benzene or benzene rich stream exiting the benzene recovery unit in regards to where it may be reprocessed in the refinery?

Response: There are no restrictions on the recovered benzene stream once it is returned to the production process. If it is stored or undergoes further treatment prior to being returned to the process, the units used for storage or treatment may require air emission controls under the rule. For example, a slop oil tank that receives recovered oil is subject to the rule, but once the oil is returned to the facility's crude oil storage tank (or other part of the production process), controls are no longer required under this rule.

3. Are there any restrictions on who may operate or own a benzene recovery unit (i.e., could the benzene recovery unit be owned/operated by a contractor rather than by the refiner)?

Response: There are no restrictions under this rule as to who may operate or own a benzene recovery unit. If the unit treats wastes at the generator's site (i.e., within the contiguous facility boundary), the generator is responsible for the unit's compliance with the rule. If the generator ships wastes offsite that require control, the generator must notify the offsite facility that the waste requires control, and the generator is responsible for the proper management of the waste at the offsite facility (i.e., if the waste is not managed according to the rule's requirements, the generator is at risk with respect to compliance).

APPENDIX B

Case Study

Appendix B
Case Study:
Application of Benzene Waste Operations NESHAP to
Wastewater Treatment Systems

NOTE: Since the time of the workshops were given, EPA has determined that clarifications to the Benzene Waste Operations NESHAP are required. Revisions to the rule were proposed March 5, 1992 (57 FR 8017) and promulgated on January 7, 1993 (58 FR 3072). Thus interpretations given during the workshop may have changed. For the latest interpretation, contact Bob Lucas, Emissions Standards Division, OAQPS (919) 541-0884.

Overview

Examples of the application of the National Emission Standard for Benzene Waste Operations (40 CFR 61 Subpart FF) to wastewater treatment systems are provided in this case study. The standards for wastewater treatment systems that manage and treat aggregated or mixed waste streams are reviewed using some simple examples. A case study problem is then presented to illustrate the application of the standard to a "real world" wastewater treatment system at a petroleum refinery.

Standards for Wastewater Treatment Systems

The Benzene Waste Operations NESHAP requires owners and operators of affected facilities at which the total annual benzene quantity from the facility waste is equal to or greater than 10 Mg/yr to remove or destroy benzene contained in certain waste streams using a treatment process or wastewater treatment system. Section 61.348 of the rule establishes the treatment standards for treatment processes or wastewater treatment systems. These standards require that if an owner or operator chooses to aggregate or mix waste streams to facilitate treatment in a wastewater treatment system, the waste streams must be treated in a wastewater treatment system that meets special requirements. Each waste management unit that comprises the wastewater treatment systems at the facility must use the appropriate emission controls as specified under Sections 61.343 through 61.347 until both of the following conditions are met:

1. The waste entering an uncontrolled unit is less than 10 ppmw benzene; and
2. The total facility-wide wastewater treatment system annual benzene quantity first entering any uncontrolled unit is less than 1 Mg/yr.

Application of Basic Standards

The application of the basic standards is illustrated in Figure 1. The drainage system, the oil/water separator, and the dissolved air flotation (DAF) unit shown in Figure 1 require controls because they receive waste with benzene concentrations of 10 ppmw or higher. The next three units require controls because even though the benzene concentration is below 10 ppmw, the mass flow rate of benzene (i.e., the annual benzene quantity) entering the units is greater than 1 Mg/yr.

Enhanced Biodegradation Units

An important exclusion to the 1 Mg/yr benzene quantity limit is: The benzene quantity entering an "enhanced biodegradation" unit from the total annual benzene quantity inventory for the wastewater treatment system is excluded if the enhanced biodegradation unit is the first exempt unit. Section 61.348(b)(2)(ii)(B) provides guidelines regarding operating conditions for what is defined as an "enhanced biodegradation" unit. These guidelines basically describe the operation of a conventional activated sludge wastewater treatment process. Activated sludge systems with benzene concentrations of 10 ppmw or higher in any influent stream will still require controls, but, if the benzene concentration is less than 10 ppmw, the annual benzene quantity entering an activated sludge system does not count towards the 1 Mg/yr control limit. Therefore, if we replace the surface impoundment in Figure 1 with an activated sludge system (refer to Figure 2), no controls are required after the equalization basin.

Multiple Wastewater Treatment Systems

The 1 Mg/yr of benzene control limit pertains to the total annual benzene quantity of the facility's wastewater treatment system and not to the annual benzene quantity of a single waste stream. For example, referring to Figure 3, Equalization Basin #1 has an annual benzene quantity of 0.8 Mg/yr while the groundwater waste stream entering Equalization Basin #2 has an annual benzene quantity of 0.6 Mg/yr. In a single train system, these equalization basins would not require controls. However the cumulative or total annual benzene quantities for the uncontrolled units in this dual train facility is 1.4 Mg/yr, which exceeds the 1.0 Mg/yr control limit. Therefore, one of the equalization basins in Figure 3 must be controlled. No requirement is provided in the rule that determines which basin is controlled since controlling either basin reduces the total annual benzene quantity in the uncontrolled units to less than 1 Mg/yr. Therefore, to comply with the rule, the facility owner or operator can choose which of the equalization basins is controlled as shown in Figures 3a and 3b. Note that if

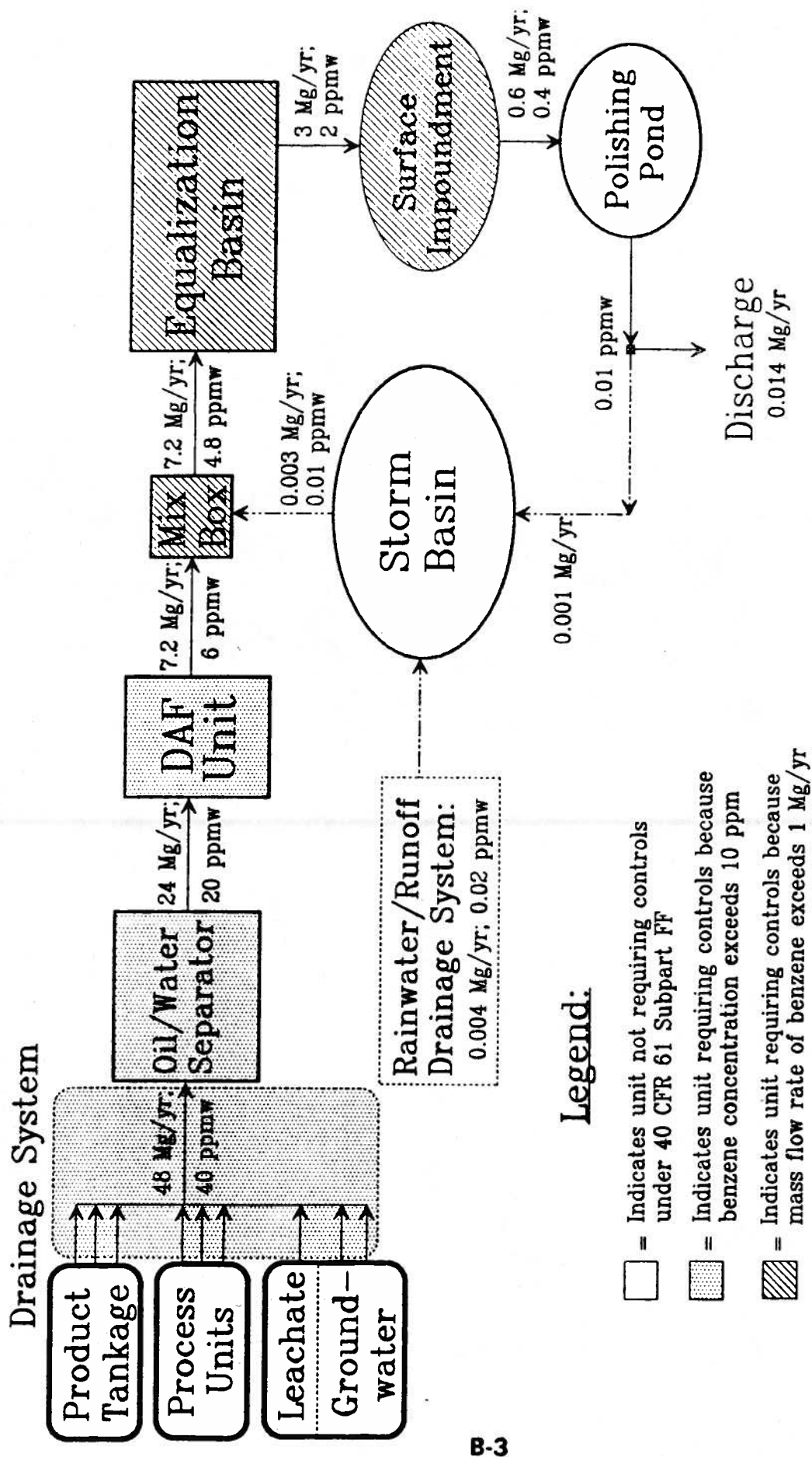


Figure 1. Wastewater treatment system showing benzene concentrations and flow rates: Example 1.

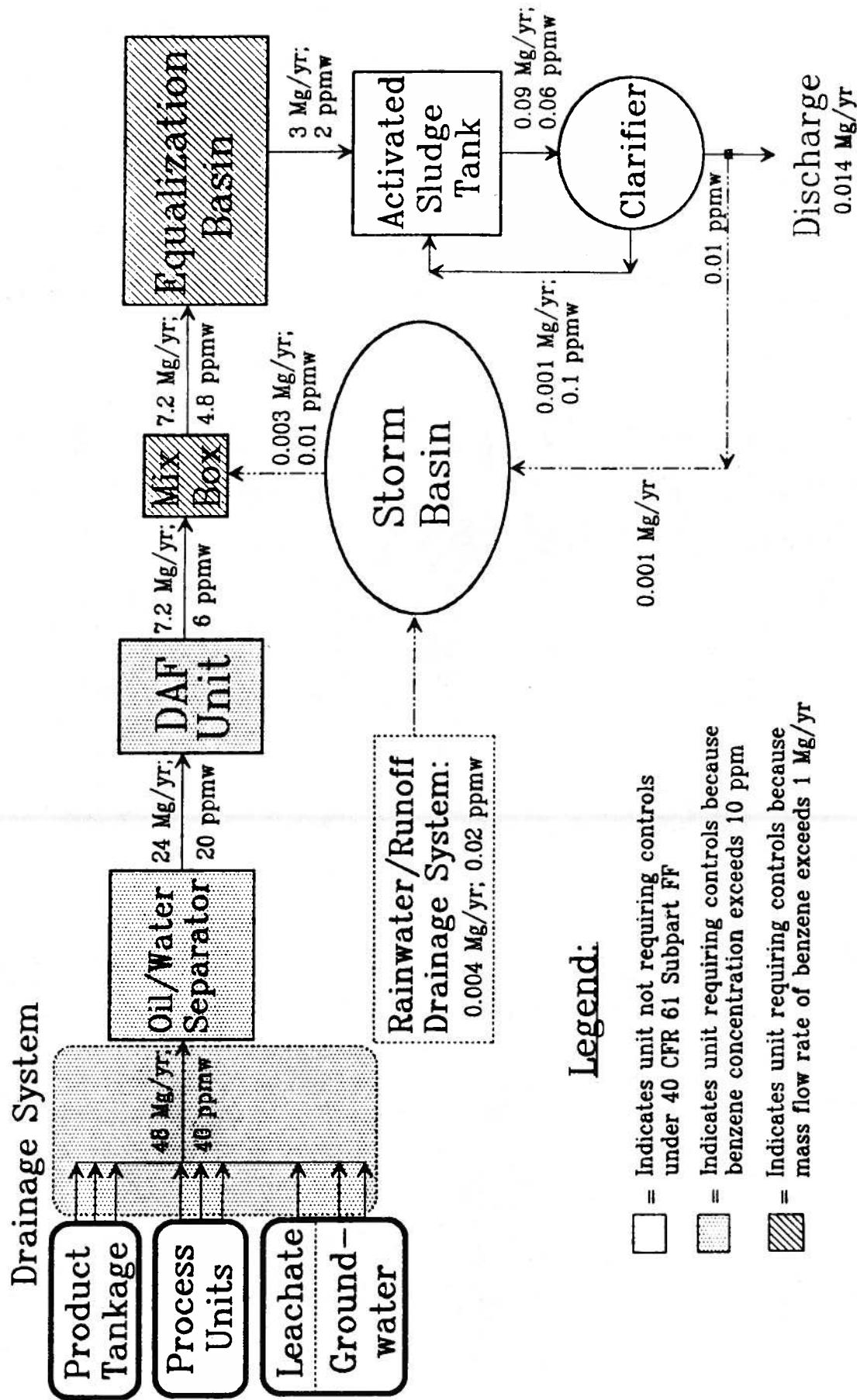


Figure 2. Wastewater treatment system showing benzene concentrations and flow rates: Example 2.

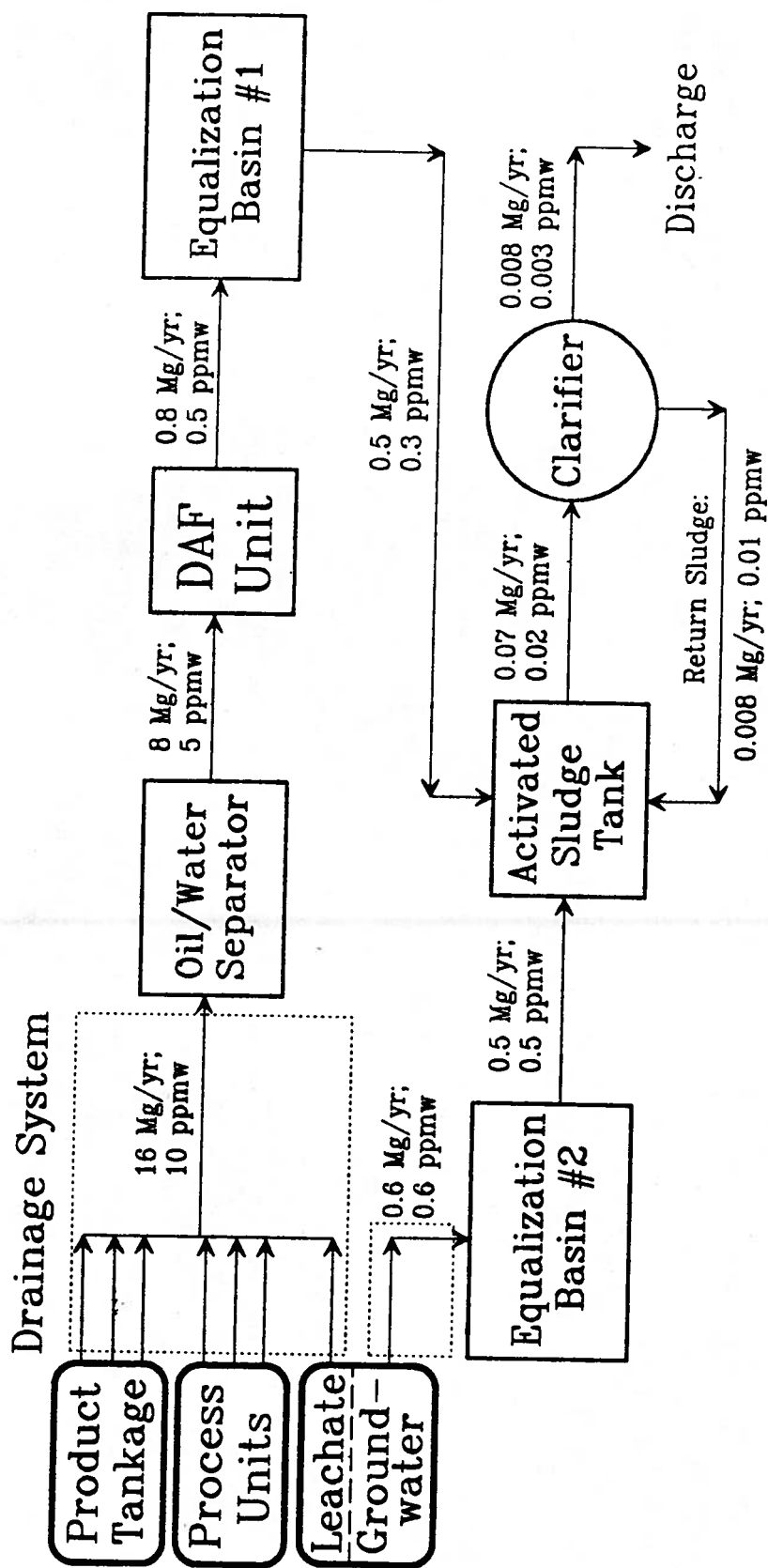


Figure 3. Wastewater treatment system showing benzene concentrations and mass flow rates. Example 3.

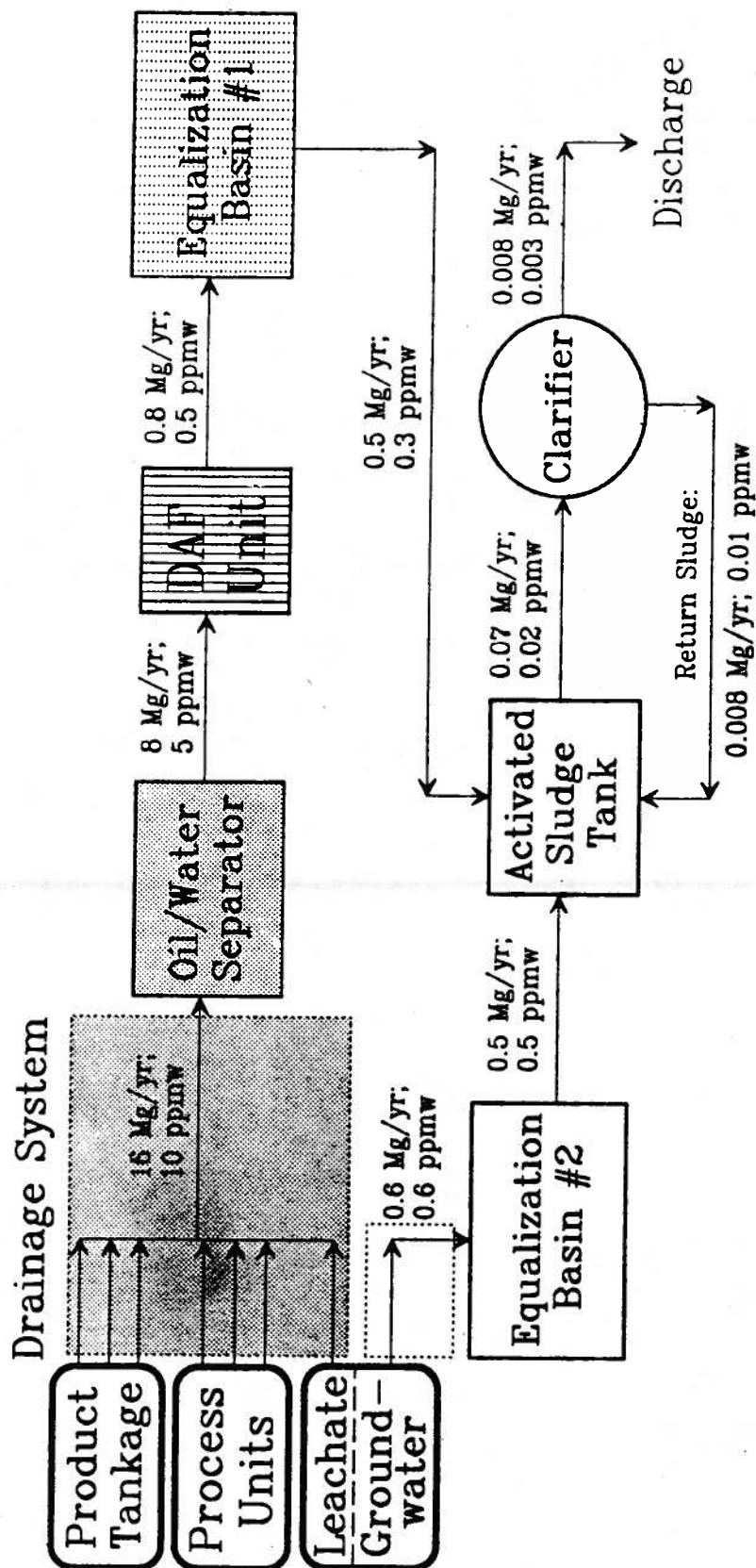


Figure 3a. Wastewater treatment system showing benzene concentrations and mass flow rates. Example 3; Solution A.

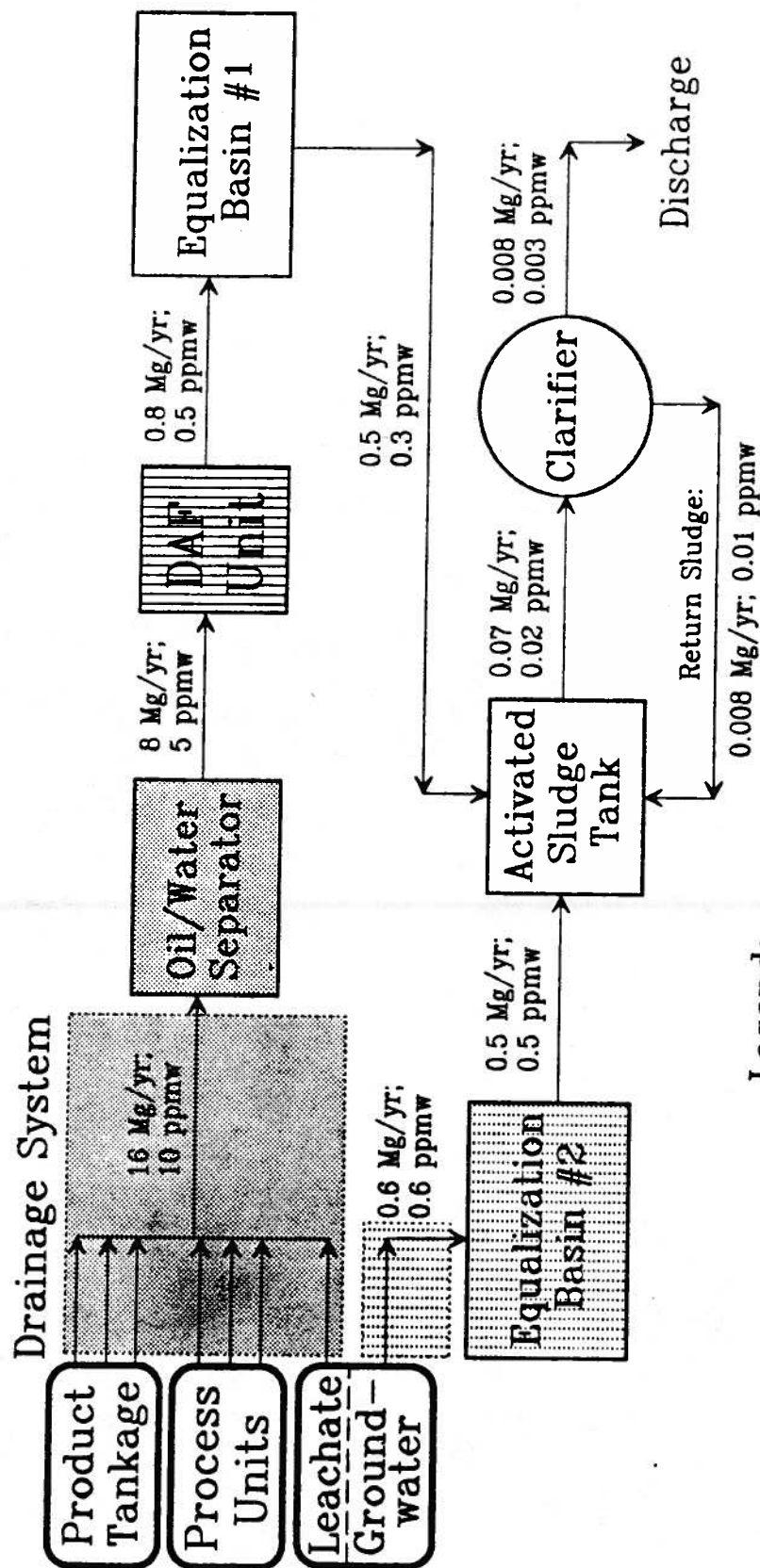


Figure 3b. Wastewater treatment system showing benzene concentrations and mass flow rates. Example 3; Solution B.

Equalization Basin #2 is selected to be controlled, the groundwater drainage system must also be controlled.

Case Study Problem:

Application of Benzene Waste Operations NESHAP to Wastewater Treatment Systems

The ABC Oil Company operates a refinery that is determined to have a facility total annual benzene (TAB) quantity greater than 10 Mg/yr, and is therefore required to treat and control certain benzene-containing waste streams at the refinery to comply with the National Emission Standard for Benzene Waste Operations (40 CFR 61 Subpart FF). Individual process wastewater streams, product tank drawdown streams, and landfill leachate streams generated by refinery processes are collected in the refinery's drain systems for the purpose of managing these wastewaters in a central wastewater treatment system. Wastewaters that have an annual average benzene concentrations above 10 ppmw are mixed with wastewaters that have an annual average benzene concentrations below 10 ppmw in the refinery drain systems. Wastewater containing hydrogen sulfides is first treated in a sour water stripper to remove the hydrogen sulfides before the wastewater is mixed with other wastewaters.

A flow diagram of the ABC Oil Refinery wastewater treatment system is shown in Figure 4. The annual average benzene concentration and annual benzene quantity for each wastewater stream are identified on the figure. To comply with the treatment standards under Section 61.348 of the rule, the refinery manager has decided to treat the benzene-containing wastewater streams using the refinery's existing wastewater treatment system. The refinery manager has asked you to determine which units comprising the wastewater treatment system are required to use control in accordance with the rule. Refer to Table 1 for the problem and Table 2 for the solution.

Under Section 61.348(b) of the Benzene Waste Operations NESHAP, special requirements apply to a wastewater treatment system in which wastewater streams having annual average benzene concentrations of 10 ppmw or more are mixed with wastewaters having annual average benzene concentrations below 10 ppmw. The waste management units handling these mixed wastewater streams are required to use controls except for those units that meet two conditions: (1) the annual average benzene concentration of the waste entering the unit is less than 10 ppmw; (2) the total annual benzene (TAB) quantity in the wastewaters first entering all affected uncontrolled units comprising wastewater treatment systems facility-wide is less than 1 Mg/yr. The wastewater treatment system configuration used for the case study problem is shown in Figure 4. The same configuration showing the case study

1. Individual Drain Systems

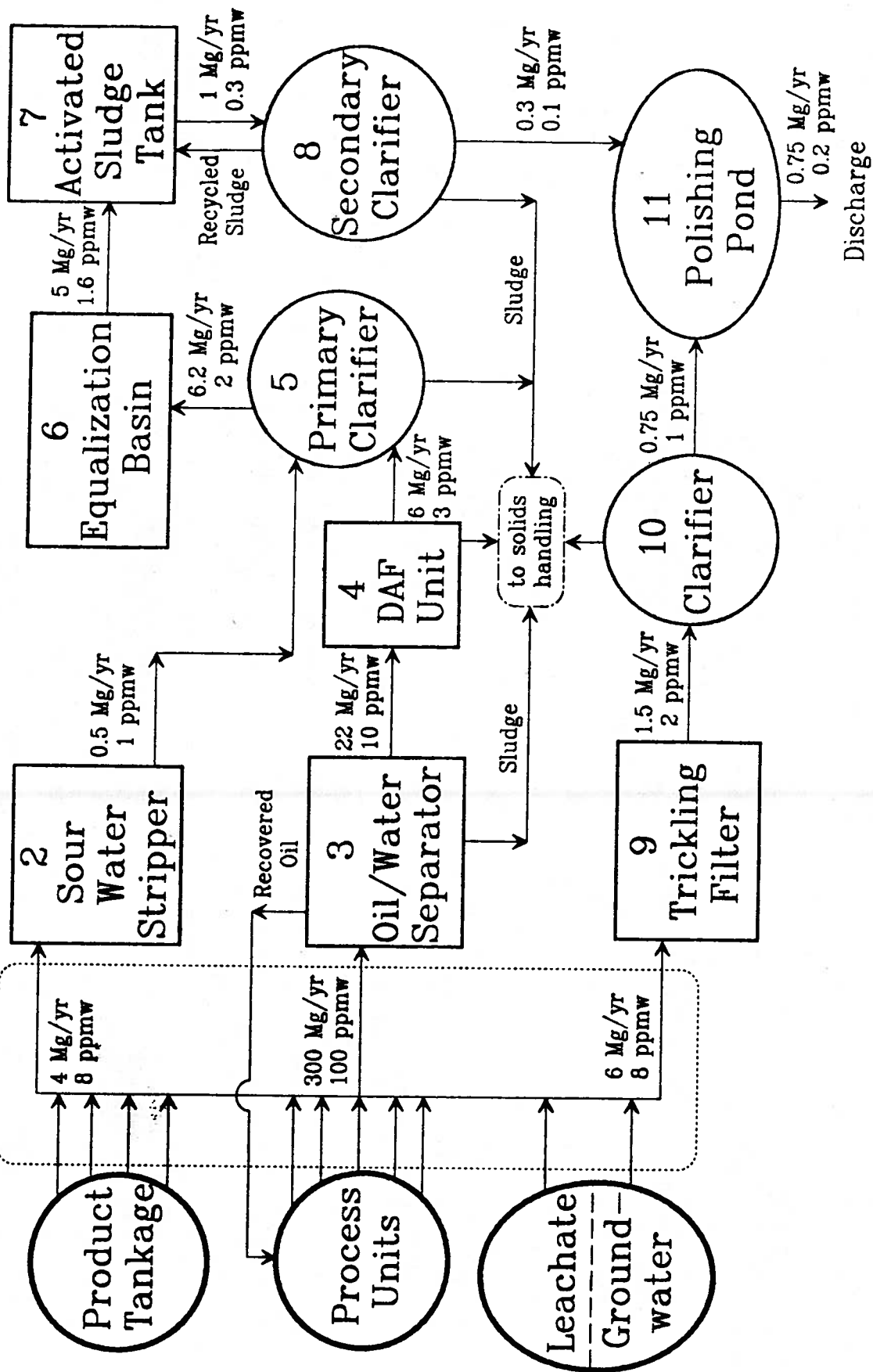


Figure 5. Wastewater treatment system showing benzene concentrations and mass flow rates: Case Study.

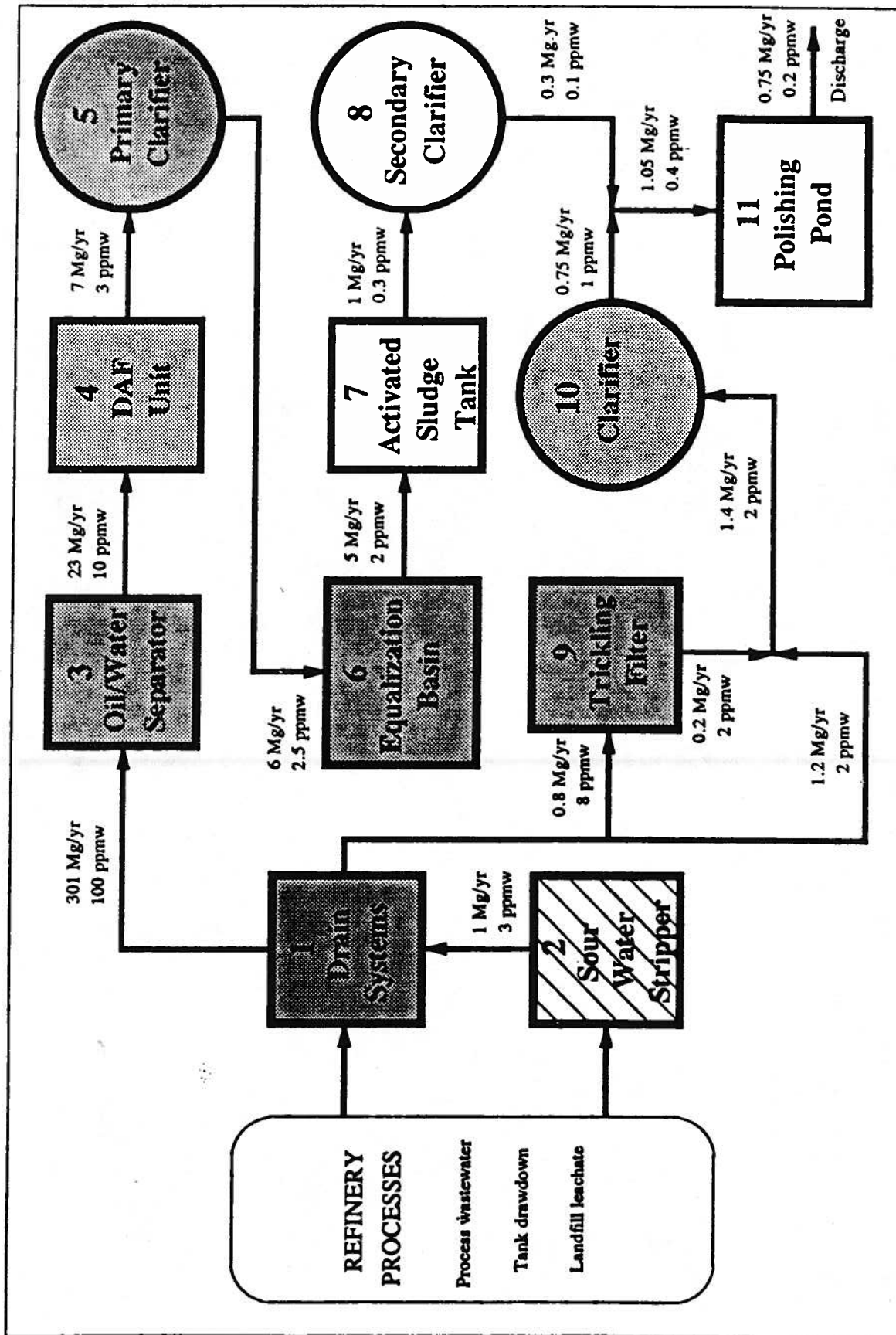


Figure 5
ABC OIL REFINERY WASTEWATER TREATMENT SYSTEM - CASE STUDY SOLUTION

solution is shown in Figure 5. A discussion of the reasons why each unit shown in the figures is or is not required to use control is presented below.

TABLE 1. CASE STUDY PROBLEM

Possible Answers for each waste management unit are:

A.No controls required.

B.Controls required: Annual average benzene concentration entering the unit is 10 ppmw or more.

C:Controls required: Annual benzene quantity entering the unit is 1 Mg/yr or more.

D.Controls required: Total annual benzene (TAB) quantity first entering uncontrolled waste management units comprising the refinery wastewater treatment system is 1 Mg/yr or more.

For each waste management units shown on Figure 4, circle the letter or letters corresponding to all correct answers for the unit (more than one answer may be correct for a particular unit).

Waste Management Unit	Answer			
1. Drain Systems	A	B	C	D
2. Sour Water Stripper	A	B	C	D
3. Oil/Water Separator	A	B	C	D
4. DAF Unit	A	B	C	D
5. Primary Clarifier	A	B	C	D
6. Equalization Basin	A	B	C	D
7. Activated Sludge Tank	A	B	C	D
8. Secondary Clarifier	A	B	C	D
9. Trickling Filter	A	B	C	D
10. Clarifier	A	B	C	D
11. Polishing Pond	A	B	C	D

Table 2. [to be inserted at a later date].

Drain Systems

The refinery drain systems combine wastewaters having annual average benzene concentrations above 10 ppmw with wastewaters having annual average benzene concentrations below 10 ppmw. This results in three mixed wastewater streams: a stream having an annual average benzene concentration of 100 ppmw and annual

benzene quantity of 301 Mg/yr; a stream having an annual average benzene concentration of 8 ppmw and annual benzene quantity of 0.8 Mg/yr; and a stream having an annual average benzene concentration of 2 ppmw and annual benzene quantity of 1.2 Mg/yr. At this point in the analysis, none of the waste management units are controlled under the rule, so the TAB quantity for the refinery wastewater treatment system is 303 Mg/yr (calculation of this value is discussed below under the oil/water separator unit). Control requirements for drain systems are specified in Section 61.346 of the rule. Thus, the drain systems are required to use controls because the conditions specified in answers "b," "c," and "d" are not met.

Sour Water Stripper

For the purpose of implementing the Benzene Waste Operations NESHAP, EPA has specified that, for a sour water stripper unit, the determination of the flow-weighted annual average benzene concentration shall be made at the exit to the unit. A "sour water stripper" must be controlled to meet the definition in the rule, i.e., it must be "operated in such a manner that the offgases are sent to a sulfur recovery unit, processing unit, incinerator, flare, or other combustion device." Consequently, none of the listed answers are appropriate. Controls are required, but not because of the reasons listed in "b," "c," or "d."

Oil/Water Separator

The annual average benzene concentration of the waste entering the oil/water separator is greater than 10 ppmw (100 ppmw). The annual benzene quantity in the waste entering the unit is greater than 1 Mg/yr (301 Mg/yr). Thus, neither of the two conditions are required for an exemption from controls is met. At this point in the analysis for an actual facility, you would conclude that the oil/water separator requires control because it does not meet either condition, and then move on to the next downstream unit. However, for the purpose of this case study problem, we will also determine the TAB quantity first entering the uncontrolled waste management units comprising the refinery wastewater treatment system from the inlet to the oil/water separator.

The TAB quantity is calculated by summing the individual waste stream annual benzene quantities for each location where a waste stream first enters an affected uncontrolled waste management unit that is included in the facility wastewater treatment system. Assuming that Unit 3 and the remaining units (i.e., Units 4 through 11) are uncontrolled, the TAB quantity is then calculated by summing the annual benzene quantity in three wastewater streams: (1) the stream flowing directly from the

drain system to the oil/water separator (301 Mg/yr); (2) the stream flowing directly from the drain system to the trickling filter (0.8 Mg/yr); and (3) the stream flowing directly from the drain system to the clarifier (1.2 Mg/yr). The TAB quantity is calculated to be 303 Mg/yr which is well above the 1 Mg/yr limit. Thus, the oil/water separator is required to use control because the conditions specified in answers "c," and "d" are not met.

DAF Unit

The annual average benzene concentration of the waste entering the DAF unit is equal to 10 ppmw. Remember that the rule requires that annual average benzene concentration of the waste entering the unit to be less than 10 ppmw as one of the conditions to be met for the exemption from controls. The annual benzene quantity of the waste entering the unit is greater than 1 Mg/yr (23 Mg/yr). Assuming at this step in the analysis that Unit 4 and the remaining units (i.e., Units 5 through 11) are uncontrolled, the TAB quantity that would be managed in the uncontrolled waste management units is calculated to be 25 Mg/yr. thus, the DAF unit is required to use controls because the conditions specified in answers "b," "c," and "d" are not met.

Primary Clarifier

The annual average benzene concentration of the waste entering the primary clarifier unit is less than 10 ppmw (3 ppmw). However, the annual benzene quantity of the waste entering the unit is greater than 1 Mg/yr (7 Mg/yr). Assuming at this step in the analysis that Unit 5 and the remaining units (i.e., Units 6 through 11) are uncontrolled, the TAB quantity that would be managed in the uncontrolled waste management units is calculated to be 9 Mg/yr. Thus the primary clarifier is required to use controls because the conditions specified in answers "c," and "d" are not met.

Equalization Basin

The equalization basin only receives wastewater from the primary clarifier. Consequently, the annual average benzene concentration of the waste entering the unit remains less than 10 ppmw (2.5 ppmw). However, the annual benzene quantity of the waste entering the unit still is greater than 1 Mg/yr (6 Mg/yr). Assuming at this step in the analysis that Unit 6 and the remaining units (i.e., Units 7 through 11) are uncontrolled, the TAB quantity that would be managed in the uncontrolled waste management units is calculated to be 8 Mg/yr. Thus, the equalization basin is required to use controls because the conditions specified in answers "c" and "d" are not met.

Activated Sludge Tank

The activated sludge tank is considered to be an "enhanced biodegradation unit" in accordance with Section 61.348(b)(2)(ii)(B) of the rule. This section specifies that the annual benzene quantity managed or treated in an enhanced biodegradation unit is not included in the calculation of the TAB quantity if the enhanced biodegradation unit is the first uncontrolled unit in which the waste is managed or treated. This means that for the purpose of calculating the TAB quantity, the annual benzene quantity entering the enhanced biodegradation unit is set to 0 Mg/yr if the annual average benzene concentration of the waste entering the unit is less than 10 ppmw. For the case study problem, the annual average benzene concentration of the waste entering the activated sludge tank is 2 ppmw. Even though the actual annual benzene quantity of the waste entering the unit is greater than 1 Mg/yr (5 Mg/yr), the TAB quantity condition that the upstream units must meet in order to be exempted from using controls is not applicable to the activated sludge tank because it is an enhanced biodegradation unit in which the annual average benzene concentration of the waste entering the unit is less than 10 ppmw. Therefore, the activated sludge unit is not required to use controls (answer "a").

Secondary Clarifier

The secondary clarifier only receives wastewater from the activated sludge tank. As discussed above, the activated sludge unit is an enhanced biodegradation unit which is exempt from having to use controls. For the purpose of calculating the TAB quantity, the annual benzene quantity entering the activated sludge tank is set to 0 Mg/yr. Consequently, it must follow that the wastewater stream entering the secondary clarifier is also set to 0 Mg/yr. Even though the annual benzene quantity of the waste entering the secondary clarifier is equal to 1 Mg/yr, the TAB quantity condition is not applicable to this unit because all of the waste managed in the secondary clarifier is received from an uncontrolled enhanced biodegradation unit. Thus, the secondary clarifier is received from an uncontrolled enhanced biodegradation unit. Thus, the secondary clarifier is not required to use controls (answer "a").

Trickling Filter

The trickling filter is not considered to be an "enhanced biodegradation unit" because it is a supported growth process rather than a suspended growth process, and it does not recycle biomass. Therefore, the trickling filter must meet both the benzene concentration and TAB quantity conditions to be exempt from having to use controls. The annual average benzene concentration of the waste entering the trickling filter is less than 10 ppmw (8 ppmw). Also, the annual benzene quantity of the

waste entering the unit is less than 1 Mg/yr (0.8 Mg/yr). Thus, whether or not the trickling filter is required to use controls depends on the TAB quantity first entering the uncontrolled waste management units comprising the refinery wastewater treatment system.

The TAB quantity is calculated based on the annual benzene entering Units 9, 10, and 11 and the decision as to which of these units will be controlled. As discussed under the activated sludge tank unit, Unit 7 does not require controls and, for the purpose of calculating the TAB quantity, the annual benzene quantity entering the activated sludge tank is set to 0 Mg/yr. Assuming that Units 9 and 10 are uncontrolled, the TAB quantity is calculated to be 2.0 Mg/yr by summing the annual benzene quantity entering the trickling filter (0.8 Mg/yr) plus the annual benzene quantity entering the clarifier directly from the drain system (1.2 Mg/yr). Assuming that Units 9 and 11 are uncontrolled, the TAB quantity is calculated to be 1.55 Mg/yr by summing the annual benzene quantity entering the trickling filter (0.8 Mg/yr) plus the annual benzene quantity entering the polishing pond from the clarifier (0.75 Mg/yr—determination of this value is discussed under the polishing pond unit). For either assumption, the TAB quantity is calculated to be greater than 1 Mg/yr. Thus, for the particular set of benzene quantities selected for the case study problem, the trickling filter is required to use controls because the condition specified in answer "d" is not met.

Clarifier

The annual average benzene concentration of the waste entering the clarifier is less than 10 ppmw (2 ppmw). However, the annual benzene quantity of the waste entering the unit is greater than 1 Mg/yr (1.4 Mg/yr) as a result of the mixing of the waste stream from the drain systems. Knowing at this step in the analysis that Unit 7 is uncontrolled and assuming that Units 10 and 11 are uncontrolled, the TAB quantity that would be managed in uncontrolled waste management units is calculated to be 1.4 Mg/yr (the sum of the annual benzene quantities entering the activated sludge tank, which is set to 0 Mg/yr, plus the clarifier). Thus, the clarifier is required to use controls because the conditions specified in answers "c" and "d" are not met.

Polishing Pond

Two wastewater streams are also mixed together prior to entering the polishing pond; one stream from the secondary clarifier and one stream from the clarifier. The annual average benzene concentration of the waste entering the polishing pond is less than 10 ppmw. The annual benzene quantity in the wastewater

stream from the clarifier is 0.75 Mg/yr. The annual benzene quantity in the wastewater stream from the secondary clarifier is 0.3 Mg/yr. However, for the purpose of determining compliance with the rule, the annual benzene quantity for the wastewater stream entering the secondary clarifier is set to 0 Mg/yr (refer to the discussion for the secondary clarifier unit). Consequently, it must follow that the wastewater stream exiting the secondary clarifier is also set to 0 Mg/yr. Even though the total annual benzene quantity of the wastewater streams entering the polishing pond is actually 1.05 Mg/yr, the TAB quantity of the waste entering the unit is calculated to be 0.75 Mg/yr for the purpose of determining compliance with the rule. Thus, the TAB quantity of the waste entering the polishing pond is less than 1 Mg/yr, and the unit is not required to use controls (answer "a").

