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by

ICF Incorporated

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TABLE OF CONTENTS

INTRODUCTION

This booklet provides answers to questions that citizens may have about

also used to burn **hazardous wastes**.* Most hazardous wastes are byproducts of a broad spectrum of industrial and manufacturing processes; other hazardous wastes result from other activities, for example, the removal of

people, animals, and plants. Incineration detoxifies hazardous wastes by destroying many of the harmful components of the wastes. Based on the results of research on incineration, EPA has concluded that incineration is the best method currently available for treating certain types of hazardous wastes.

Why is hazardous waste incineration important?

the toxic qualities of the wastes.

incinerators operating in the U.S. Most of these

wastes removed from the site. In recent regulations that set treatment standards for hazardous wastes that are to be disposed on land, EPA has

at their first appearance.

identified incineration as the **Best Demonstrated Available Technology** (that is the commercially developed technology that

EPA believes that greater quantities of hazardous wastes will be treated using incinerators in the

of November 8, 1989 for final decisions on permit

What information can be found in this booklet?

The focus of this booklet is hazardous waste incin

regulated as hazardous under RCRA. Certain wastes that have dangerous properties, for example, radioactive wastes and polychlorinated biphenyls (**PCBs**), are not included in the legal definition of hazardous waste. Management of radioactive wastes is regulated by the Nuclear Regulatory Commission and the Department of Energy; management of PCB

under the Toxic Substances Control Act (**TSCA**).

EPA's regulatory program for PCB incineration is based on a similar framework of standards, permits, and enforcement. Also

provides information on this program. For more information on incineration of PCBs, contact your EPA regional office (see page 44).

This booklet is organized into six chapters. The first chapter answers

provides a general description of EPA's program for regulating hazardous waste incinerators and describes the federal performance standards for

hazardous waste treatment, storage, or disposal facilities. The last chapter, Chapter 6, explains the potential risks involved in hazardous waste incineration.

HAZARDOUS WASTE INCINERATION: A TECHNICAL OVERVIEW

incineration, including the following:

- [redacted] of hazardous waste
- [redacted] suitable for incineration;
- Descriptions of [redacted]
- [redacted] control devices used on hazardous waste incinerators;
- [redacted] and equipment are discussed.

BASIC PRINCIPLES OF INCINERATION

What is incineration?

Incineration is the burning of substances by controlled flame [redacted]

[redacted] burn. A hotter fire also burns more completely than a cooler one. As a [redacted] to higher temperatures before they [redacted] 2000 F to 2500 F) to ensure that virtually all organic compounds in the wastes are destroyed. Although

incineration does not destroy **inorganic compounds** (carbonless compounds

compounds.

How does an incinerator work?

Incineration involves four basic steps:

- Wastes are fed into the incinerator;
- Wastes are burned, destroying organic compounds

and the physical and chemical characteristics of the wastes the incinerator is designed to burn. In addition, steps may be added at various points to improve efficiency. For example, in some systems

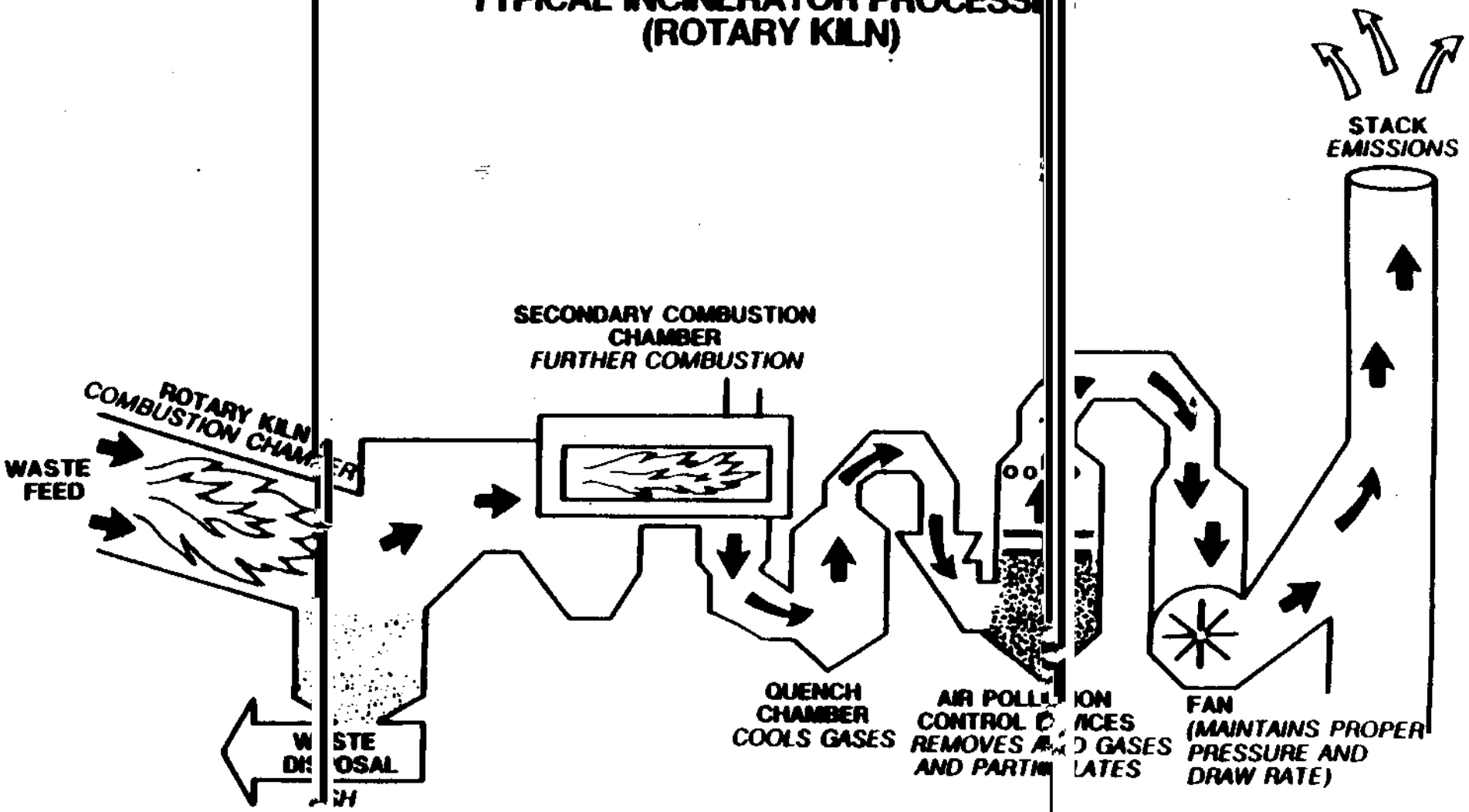
rotary kiln system, one

During a burn (a period during which the incinerator is in operation),

fine droplets that burn more easily. Solid wastes may be fed into the incinerator in bulk or in containers using a conveyer or a gravity system.

high temperatures. As the wastes are heated, they are converted from solids or liquids into gases. The gases are mixed with air and passed through the extremely hot flame. As the temperature of the gases rises, the organic compounds in the gases begin to break down into atoms. These atoms

TYPICAL INCINERATOR PROCESS
(ROTARY KILN)



such as carbon dioxide and water. Depending on waste composition, other inorganic compounds (for example, acid gases such as hydrogen chloride) may form. This entire process is called **combustion**.

Temperatures in combustion chambers vary, but are generally in the [redacted] of 1,800°F to 2,500°F.

[redacted]

[redacted] completed in the **secondary combustion chamber** after the compounds have [redacted]

[redacted]

Combustion yields two residual products: solids, in the form of ash, and gases. Combustion gases are composed primarily of carbon [redacted]

[redacted] made up of carbon [redacted] salts [redacted]

[redacted] generally produces [redacted]

[redacted] residuals exhibit the characteristics of [redacted] processes, whether or not the [redacted]

[redacted] be treated before release?

Following [redacted]

[redacted] a **quench chamber**, where gases are cooled by direct mixing with water. **Air pollution control devices** are used to remove [redacted]

Does incineration destroy all organics in the waste?

[redacted]

[redacted] (that is, the total destruction of all organic compounds), and new technology is being developed that will improve upon current levels of performance. Complete combustion is only a theoretical concept, however, since the development of a 100 percent efficient incinerator is not possible.

The three critical factors that determine the [redacted]

[redacted]

[redacted] carbon monoxide levels in emissions, allowable [redacted] maximum waste feed rates.

What is contained in the gases emitted from the incinerator?

Incinerator emission gases are composed primarily of two harmless inorganic compounds, carbon dioxide and water. The type and [redacted] other compounds [redacted]

[redacted] inorganic compounds contained in the original waste and organic and inorganic compounds created during combustion:

[redacted] but a very small quantity of the organics in the [redacted]

[redacted] combustion chamber. As the gaseous, uncombusted organics move through the remainder of the incinerator, some are removed by air pollution control equipment. RCRA standards set a limit on emissions of designated organic compounds.

- Inorganic compounds from the original waste. Inorganic compounds, such as salts and metals, do not combust. [redacted] the combustion gases,

depending primarily

not 100 percent efficient

formed during the combustion of any organic material

of many different types of PICs and

a state-of-the-art incinerator, PIC formation is minimized by keeping the initial products of combustion at high temperatures for an appropriate length of time. PICs are destroyed by the high temperatures maintained in the combustion zone or a secondary combustion chamber. Air pollution control devices also remove PICs.

waste. In addition to carbon dioxide and water, combustion always produces small quantities of

(including many hazardous wastes) may create other inorganic compounds, depending on what is being burned. Many hazardous wastes contain chlorinated organic compounds, sulfur, or

compounds yields hydrogen chloride

such as coal-burning power plants. Because it

is more uniquely associated with the burning of hazardous wastes, RCRA standards place limitations on emissions of hydrogen chloride

[redacted]

[redacted] waste incinerators?

The two most common types of hazardous waste incinerators are rotary kiln and liquid injection. Other types exist, some of which are becoming more widely used; others are still in the developmental stage. Choice of a particular [redacted]

Rotary kiln incinerators are versatile units that can accept gases, liquids, sludges, slurries, and solids either separately or simultaneously, either in [redacted]

[redacted] gases then pass into another combustion chamber (called an afterburner or the secondary combustion chamber) where more complete combustion is achieved. Ash residue is removed from the lower end of the kiln.

Liquid injection incinerators are capable of accepting gases, liquids, and slurries. The [redacted] injection incinerator is a nozzle or some other device that "atomizes" the liquid stream. Pumped at high pressure through the atomizer, the liquids emerge as tiny droplets that mix well with air and auxiliary fuel and easily convert into gases. Liquid injection systems are often designed for specific wastes. Consequently, the design of the atomizing device limits the types of [redacted] such as the rotary kiln.

Mobile incineration systems [redacted] incinerators are usually smaller than stationary facilities, but they operate on identical principles. Incinerators may also be mounted on ships.

[redacted]

incinerators?

Combustion gases are typically treated to remove inorganic acid gases and particulate matter. Particulate matter (and adhering metals) can be removed with several devices. One of the oldest methods is baghouse filtration [redacted]

[redacted]

providing the greatest possible contact between the water and the gases. The water is broken up into fine droplets and sprayed into the gas or the gas is broken up into small bubbles and flows up through the water. This allows hydrogen chloride, an acid gas, to dissolve in and be neutralized by the alkaline water. Also available are dry scrubbers which use either dry scrubbing material or an alkaline slurry which is dried when it is injected in to the hot combustion gases [redacted]

Many air pollution control devices use water, thus creating [redacted]

these requirements must be treated before being disposed or released to a river, stream, or sewer system. Possible treatments include settling, metals precipitation, and neutralization.

What maintenance does an incinerator require?

Equipment maintenance varies greatly depending upon the type of equipment, its materials of construction, and [redacted]

incinerator must be maintained properly in order to achieve the

the performance and operating condition of older incinerators are

when permits come up for renewal.

ALTERNATIVES TO INCINERATION

compounds, permanently eliminating environmental hazards posed by them

incinerator ash requires disposal in a landfill, the process of incineration

react with other compounds in the landfill to form acids that hasten deterioration of liners that contain the wastes in the landfill.

disposed on land

Rather than building incinerators to treat their hazardous waste, why don't companies change their production processes so that these wastes are not produced?

Waste minimization

the problem of hazardous waste. EPA encourages waste minimization, and is assisting companies in determining how waste minimization techniques can be

applied to their processes. The

studied. Incineration is one type of thermal treatment that

may play an increasingly significant role in the future. These new technologies include **pyrolysis**, **molten salt reactors**

an economical and effective alternative to incineration. **Biological treatment** breaks down organic wastes using

from

available for the treatment of many organic wastes. Although there are still some areas of technical and scientific uncertainty concerning incinerator emissions, incineration is preferable to alternative

[redacted] WASTE INCINERATORS

[redacted] incineration of hazardous wastes, is regulated under Subtitle C of The Resource Conservation and Recovery Act (RCRA).

[redacted] RCRA provides EPA with the authority to develop standards for producers and transporters of hazardous waste, as well as for facilities that treat, store, or dispose of hazardous waste. These standards must be sufficiently stringent to protect human health and the environment.

Who regulates hazardous waste incinerators?

[redacted] the federal RCRA program, and all [redacted] have been developed under RCRA to ensure that incineration is carried out in a safe manner and poses no threat to the health of people living or working nearby or to the surrounding environment. All incinerators emit gases through a stack, or chimney, as the final step in the incineration process.

[redacted] the emissions is the major determinant of the risk of incineration. The performance standards cover emissions of designated organic compounds, hydrogen chloride, and particulate matter.

[redacted] discussed in more detail in Chapter 5.

How can EPA or the states [redacted]

[redacted] treat, store, or dispose of hazardous wastes, must apply for and receive a RCRA [redacted] approved RCRA programs. The procedures followed for issuing or denying a permit, including provisions for public comment and participation, are similar [redacted]

Once a permit is issued, the owner or operator of the incinerator is legally bound to operate according to the conditions specified within it. The permitting agency enforces the permit by periodically inspecting the facility to ensure that it is meeting the conditions [redacted] a broad range of civil and criminal actions [redacted]

To qualify for permitting, an incinerator must be able to burn wastes and cleanse combustion gases so that [redacted] combustion of the waste [redacted] one molecule released out of every 1,000,000 molecules.

Do performance standards apply to all pollutants present in the original waste?

It is technically infeasible to monitor DRE results for all organic compounds contained in the waste feed. Therefore, selected hazardous compounds, called the **principal organic hazardous constituents (POHCs)**, are designated in the permit. POHCs are selected based on their high concentration in the waste feed and their difficulty to burn compared to other organic compounds in the

[redacted]

[redacted] pounds per hour, and (4) a limit of 100 [redacted]

[redacted] chlorinated hydrocarbons. Although the 99.99 DRE is protective of human health and the environment, a more stringent standard of 99.9999 [redacted]

[redacted]

[redacted] performance standards differ for incinerators which accept PCBs?

[redacted] these standards require 99.9999 DRE. Although the general TSCA standard for [redacted] liquid PCBs should result in 99.9999 DRE, EPA requires permit applicants wishing to burn liquid PCBs to make a demonstration to prove that they will achieve 99.9999 DRE during incineration.

CHAPTER 3

PERMITS AND THE PERMITTING PROCESS

Permits are developed by determining [redacted] may operate, while meeting all applicable standards [redacted] which a facility

[redacted] incinerator. The permit similarly sets conditions for all other hazardous [redacted]

- The purpose of the permit;
- How the permitting process works;
- How the public can participate [redacted]
- Information on trial burn procedures.

PERMITS AND THE PERMITTING PROCESS

How does the permit ensure that privately owned or operated hazardous waste incinerators [redacted]

[redacted] operating conditions that have been proven to result or are expected to result in the incinerator meeting the performance standards. The permit may specify different operating conditions for different types of waste feeds. These [redacted] any parameter the permitting agency considers necessary to ensure that the incinerator meets performance standards.

Can a hazardous waste incinerator operate without a permit?

Recognizing that it [redacted] the United States many years to process all permit applications, Congress allowed hazardous waste facilities that were under construction or in operation by November 19, 1980 [redacted] permit application.

Part A of the permit application is a standard form, while Part B is a more extensive description of the facility, including detailed and highly technical

application and several more for the permitting agency to complete its review and provide for opportunity for public comment. Although interim status facilities are subject to general and specific standards, these standards are less strict than those that apply to permitted facilities.

interim status incinerators. Owners and operators of interim status incinerators that failed to meet this deadline will lose interim status on November 8, 1989

"new" incinerators (those for which

waste under a specific set of operating conditions.

conditions to support their applications. These data are developed during a **trial burn**, a test during which sufficient data are gathered to assess the incinerator's ability to meet performance standards. Although the owner or operator of an interim status incinerator does not require prior

the trial burn data, if insufficient to evaluate incinerator performance. Therefore, many owners or operators of interim status incinerators seek prior approval of a trial burn plan, a detailed description of how the trial burn is to be carried out.

Who are the incinerators permitted?

Anyone wishing to operate a new hazardous waste incinerator is required to obtain a RCRA permit before construction of the unit begins. The RCRA permit

over a range of conditions; (3) the period following the trial burn (this period may last several months), during which time the data from the trial burn is

evaluated and the facility may operate under conditions specified by the permitting agency; and (4) the final operating period, which continues throughout the life of the permit (10 years or less).

The permitting agency specifies operating conditions for all four phases

If the trial burn results fail to verify that performance standards can be met

minimum performance standards, or, in the case of a new incinerator, a trial burn plan detailing how these data will be

and quantities of wastes that will be managed at the facility. Part B, which

a application to be several volumes in length.

How is a permit application reviewed?

The process by which a permit application is reviewed may vary somewhat depending on the permitting agency. The basic process, however, consists of five steps:

(1) EPA or the authorized state reviews the application for completeness. If information is missing, the reviewer issues a **Notice of Deficiency** to request additional information from the applicant.

other information submitted by the applicant (for example, performance data from an interim status incinerator or a

permit does not constitute final approval of the permit application. The draft permit, however, consists of all the same elements as a final permit, including technical

(4) The permitting agency solicits and receives comments from

period.

(5)

complete administrative record.

The permit, as issued, may differ from the draft permit. It may correct mistakes (for example, typographical errors) or it may contain substantive changes based on technical or other

before the permit is issued.

Who decides whether or not the permit should be issued or denied?

The person with primary responsibility for evaluating the application and for writing or denying the permit is called the

responding to comments from the public on the proposal, and modifying the proposal, as necessary. The permit writer, by virtue of his involvement in every stage of the permitting process, is the key staff member responsible for determining the

operating conditions under which the f[illegible]

permit. The responsibility for that decision [illegible] on whether to grant or deny a

permit?

[illegible] issuing a RCRA

In 1979 EPA determined that [illegible]

Policy Act when actions of federal agencies may adversely affect the environment. Since the procedures for issuing RCRA permits result in a rigorous review of [illegible]

What is to prevent a facility, once it has a permit from [illegible]

incinerated, and specifies whether the facility can incinerate only its own wastes or can accept wastes from other generators. If the facility wishes to deviate from any condition [illegible]

follow public notice, comment, and hearing procedures similar to those required for the original permit.

What happens if an incinerator deviates from the operating condition[illegible]

During operations the permit requires [illegible]

[illegible] protected incinerators. This system promptly cuts off the feeding of

The mechanisms that stop the waste feed [illegible]

[illegible] trigger the closing of the feed valve. The automatic shut-off

[redacted] unless the owner or operator can demonstrate that

potential problems (if the system approaches permit or other operating limits. [redacted] any change in parameters that would trigger the automatic shut-off system. Then, if the automatic shut-off fails, the plant operator can cut off the waste feed using manual controls.

PUBLIC INVOLVEMENT IN THE PERMITTING PROCESS

How can local residents make sure that the permitting agency considers their concerns before granting the facility a permit?

Before a permit is issued [redacted]

issue or deny the permit. The agency issues a **public notice** of its decision, allowing a minimum of 45 days for written comments. In the special case of permits for the incineration of [redacted]

[redacted] must prepare a fact sheet to inform citizens about the permitting process and the basis of the agency's tentative decision. Both the fact sheet and the draft permit are made available for public review.

[redacted]

permitting agency to rethink certain aspects of the draft [redacted] address concerns about the technical operations of the facility.

[redacted] written comments the only way citizens can participate in the permitting process?

[redacted] citizens can participate in the permitting process. EPA or the state must hold a formal public hearing on the draft permit, if someone requests one in writing during the public comment period. The hearing provides an additional

[redacted] hearing officer. If interest warrants, the [redacted] hear their views and respond to questions.

After the close of the public comment period, the permitting agency carefully considers the entire administrative record for the permit application

[redacted]

[redacted]

[redacted]

[redacted]

RCRA requires that facilities operate in a manner that [redacted]

[redacted]

What if residents are opposed to the location and operation of an incinerator in their community?

During the public comment period, all members of the community are afforded an opportunity to express their concerns about the operating conditions proposed by the permitting agency in the draft permit or about any aspect of the data submitted by the permit applicant as part or in support of the application. The permitting agency will take into account any technical information relating to the ability of the incinerator to meet performance standards [redacted]

[redacted]

reject permit applications on non-technical grounds. If the permit applicant demonstrates that the facility meets all RCRA standards and does not pose a

Will the operation of the incinerator produce unpleasant smoke, odors, or noise that disturbs people living and working nearby?

A well-operated incinerator is smokeless and odorless. A white cloud, similar to what can be seen from a power plant, may be visible at times. These

[redacted]

[redacted] to address these problems.

LOCATION AND PERMITTING

Are there any prohibitions or restrictions on the location of hazardous waste incinerators?

RCRA currently includes special requirements for incinerators and other facilities located in [redacted]

[redacted] these general standards include archaeological [redacted]

[redacted] will be denied. [redacted] of the permit application

Why is a particular location chosen for an incinerator when there may be more suitable sites?

Criteria for site selection depends on the needs the incinerator is [redacted]

[redacted] zoning and land use are local issues. EPA develops RCRA standards so that [redacted] patterns. The permitting agency considers this information in developing permit conditions to ensure that operations will meet all applicable RCRA standards.

TRIAL BURN PROCEDURES

What is a trial burn?

A trial burn is a test of an incinerator's ability to meet all applicable performance standards when burning a waste under a specific set of operating

What happens during the trial burn?

Because data from the trial burn are the main basis for proving that the

meeting performance standards, the trial burn is designed to provide data that demonstrates the incinerator's capabilities.

parameters. In order to make judgments concerning the incinerator's destruction and removal efficiency (DRE), the owner or operator must also measure the quantities of designated constituents, the principal organic hazardous constituents (POHCs), emitted from the incinerator. The permitting agency

- Actual wastes or mixtures of wastes normally

- Artificial wastes selected by the applicant that provide suitable proxies for the actual wastes.

In order to establish the most flexible permit conditions, the trial burn may involve incineration of different waste feeds using a wide range of operating conditions. This allows the development of different permit

waste feeds under less severe operating conditions (for

[redacted]

[redacted] an additional trial burn unless the permitting agency is satisfied that the [redacted]

[redacted] incinerator failed to meet the standards for hydrogen chloride emissions, the facility operator may modify the [redacted]

[redacted] case of an interim status incinerator) or permit holder [redacted]

[redacted] wishes, the permit holder wishes to expand the range of allowable operating conditions or waste feed types to allow greater flexibility, he or she must seek a permit modification.

[redacted]

[redacted] demonstrate the conditions under which the incinerator will achieve the minimum

performance standards for specific wastes covered by the application. If the data are not considered adequate, the permit writer requests the applicant to submit other data or agree to perform a trial burn. Acceptable data are

these data during normal operations. Applicants for a new incinerator might

burn pose a serious risk to human health and the environment?

A trial burn is conducted to show that the incinerator can operate in a

To ensure that trial burns will be properly planned and executed, RCRA

Within 90 days following the trial burn, the applicant must provide

data.

After the data have been submitted, the permit writer reviews the data to determine whether the performance standards were met and under what range of

[redacted] of the trial burn reflected in the permit?

For each type of waste feed to be burned by the incinerator, the permit specifies a set of operating conditions consistent with those conditions demonstrated during the trial burn to result in compliance with the performance standards. At a minimum, the permit specifies operating conditions for [redacted]

[redacted] necessary to ensure compliance with the performance standards.

[redacted] may enter into this phase of operations. Otherwise, the permit will require modification before this phase of operations may begin.

CHAPTER 4

[redacted]

facility complies with all permit conditions. Facility inspections are the main tool by which federal or state officials monitor for compliance [redacted]

[redacted]

The principal goal of the RCRA compliance monitoring and enforcement program [redacted]

[redacted] civil actions, and criminal actions.

Administrative actions provide enforcement [redacted]

[redacted] will be taken if the action is not taken by a specific date.

[redacted]

violations. Section 3008 of RCRA identifies seven violations that carry criminal penalties. Penalties for six of the seven violations [redacted]

transporting waste to a facility not covered by a permit or by interim status.

[redacted] consists of the following steps:

[redacted] facility's permit and other agency records on the facility to identify any problems that may be encountered.

- The inspector enters the facility, identifies himself or herself, and describes the nature of the inspection. An opening conference is held with the owner or operator to describe the information and samples to be gathered.

- The facility is inspected. The inspection includes examination of facility records, possible collection of samples, and observation of the facility including the incinerator and any other hazardous waste management operations. The inspector will also observe all associated activities, such as unloading of [redacted] visit.

- The inspector holds a closing conference with the [redacted] the inspection, including the results of sampling [redacted] Inspections usually last between one day and a week.

If the facility is in violation of the permit, enforcement actions may be taken. Enforcement actions can range from informal actions to criminal judicial [redacted] regional offices have broad discretion in these matters.

[redacted] As such, EPA has not exercised its authority under RCRA to require that [redacted] maintaining a full-time inspector at each facility. These techniques

include periodic inspections (both [redacted]

automatic waste feed shut-off). The [redacted]

enforcement program, require that inspectors be present at hazardous waste [redacted]

RCRA requires that all federal or state-operated facilities [redacted]

all regional offices according to criteria that ensure greater attention to facilities of greater concern. [redacted]

Is the facility given notice before an inspection is made?

Normally, facilities are given notice of an upcoming inspection. Advanced warning does not diminish the effectiveness of the inspection because the primary purpose of a routine inspection is to examine ongoing facility records. These records are generally more revealing of ongoing practices than observations of facility operations [redacted]

[redacted] at the discretion of the inspecting agency.

[redacted]

The permitting agency cannot delegate its enforcement responsibilities to [redacted]

carried out at the facility, these agencies can help ensure that individual [redacted]

[redacted] they have observed?

Citizens should contact the regional EPA office or the state environmental [redacted]

welcomes the active participation of citizens on issues involving hazardous [redacted]

[redacted] confidential business information" and will [redacted] trade secrets.

CHAPTER 5

GENERAL STANDARDS FOR FACILITIES OPERATING

waste transportation, waste testing and storage, recordkeeping, personnel training, and insurance and closure requirements.

commonly used in association with incinerators than other types (for example, surface impoundments and waste piles).

The chapter provides information on the following:

- Prevention of spills and leaks during storage;
- Requirements for handling incompatible, reactive, and
- Management of treatment residues;
- Burning
- Procedures and requirements that protect the public and facility personnel in the event of a spill or an emergency at the facility;
- Protection from floods;
- Measures required for
- Procedures required

[redacted] the incinerator facility?

[redacted] hazardous waste. These standards govern [redacted] vehicles.

[redacted] identification number before it can legally accept wastes for shipment (except in certain emergency situations). Transporters are required to take immediate action to notify the proper authorities if an accident causing a release of hazardous waste occurs, and are liable for the cost of cleaning [redacted]

[redacted] generator fills out a manifest form that designates a final destination [redacted] specific incinerator facility). Each time the shipment changes custody (generator to transporter, transporter to incinerator facility), the manifest is signed to acknowledge the transfer of custody and a copy is retained by each party. When the shipment reaches the designated facility, the owner or operator of the facility must send a copy of the [redacted]

[redacted] keep track of wastes that are accidentally spilled and helps to prevent illegal [redacted]

[redacted] these releases are referred to as **fugitive emissions**. These emissions will occur at all sites at which hazardous wastes are managed, including incinerator sites. To ensure that problems do not occur during storage of wastes, RCRA [redacted]

[redacted] vapors, dusts, or liquids. Common containers for storing hazardous waste

include hoppers and metal drums. Standards for hazardous waste [illegible]

[illegible] (that is, areas in which any leaks or spills will be safely held until they can be cleaned up).

Tanks are sometimes [illegible]

[illegible] professional engineer that the tank will withstand expected physical and chemical stresses. A corrosion system must also [illegible]

[illegible] leaks or spills until they can be cleaned up). These systems must be designed so that leaks or failure of the tank or the secondary containment system itself are detected within 24 hours. RCRA standards require daily inspections of tanks.

HANDLING OF WASTES AT THE FACILITY

What happens to a shipment of waste from the time it arrives at the facility until the time it is incinerated?

Before a facility may treat or accept a waste for management, it must [illegible]

Waste Analysis Plan, which is a part of its permit application and which is [illegible]

its permit conditions. Otherwise, it must refuse to accept the waste and the shipment must be returned to the generator. In the event that a waste shipment deviates either from the specifications of the accompanying manifest or from characteristics expected from earlier analyses, the facility must follow procedures specified in the Waste Analysis Plan for resolving the discrepancy.

Once a shipment of waste has been accepted, it may be stored at the facility [illegible]

to justify a continuous burn. In some cases wastes may be blended together or

[redacted]

must be placed in container areas or tanks having separate secondary containment

RCRA standards include explicit criteria for identifying ignitable and reactive wastes. Ignitable wastes include liquid wastes with **flash points** less than 140°F; non-liquid wastes that under standard pressure and temperature could

[redacted]

reactive wastes may be handled only in areas where smoking and open flames are prohibited. Containers with ignitable or reactive waste must be located a minimum of 50 feet inside the facility's property line. For tanks storing these wastes, the facility must follow the National Fire Protection Agency's

[redacted]

How are treatment residues, such as ash from the incinerator, managed?

[redacted]

hazardous wastes. Incinerator ash is generally disposed in a hazardous waste

[redacted]

to Clean Water Act standards, as well as RCRA standards, before discharge. Disposing of wastewaters in streams and rivers requires a National Pollution Discharge Elimination System (NPDES) permit. These permits place restrictions

and other characteristics (such as temperature). To meet these requirements, the facility may treat its wastewaters before disposal. Disposal through the sewer system may also require that the wastewaters be treated to meet Clean Water Act standards.

RCRA standards allow for exempt

whether the wastewaters are considered hazardous

[illegible]

How will equipment malfunctions or other problems be detected?

equipment, and operating and structural equipment which prevents, detects, or responds to spills or releases be inspected by the owner or operator according to a written schedule. The inspection frequency for each item depends

into the permit.

Loading and unloading areas, and other areas where spills may occur, must be inspected daily when in use. Tank systems must be inspected daily, while container storage areas must be inspected at least weekly for leaking containers and deterioration of containers

or to the environment.

Will employees be able to recognize and respond quickly to problems?

RCRA standards require that facility personnel be trained to perform their jobs safely and to respond properly to both emergencies and routine

lacks. Personnel must also be trained to [illegible]

program will correspond to actual job tasks must be included with Part B of the

SPILLS AND EMERGENCIES

occurs, will be detected soon after. Areas where wastes are transferred or

transferred from one container to another. Spills can be prevented, however,

include draining liquids and bleeding pressure from connection lines before wastes are transferred.

application and is incorporated by reference into the permit.

A copy of the Contingency Plan must be maintained at the facility and copies must be distributed to all local officials who may be involved in emergency response. The plan must inform police, fire departments, and emergency response teams of the facility layout; identify the characteristics of the hazardous

wastes present; describe the hazards associated with the wastes and the processes in use; indicate the probable location of employees during normal operations; and designate personnel [redacted]

[redacted] an emergency.

The plan must contain the names, addresses, and phone numbers of facility personnel qualified to act as "emergency coordinators." [redacted]

activities at the facility, the location [redacted] operations and

[redacted]

If a release, fire, [redacted]

[redacted]

- Notify local agencies if their help is needed;
- Identify the character, amount, source, and extent of any releases; and
- Assess possible hazards to human health and the environment.

If the coordinator determines that [redacted]

be taken to ensure that fire or explosion does not recur, or spread to other wastes. After the emergency, released wastes and materials contaminated with released wastes must be recovered and stored for proper treatment or disposal.

How will individuals or the community be compensated for any negative [redacted]

[redacted]

[redacted] facility be secured from vandals or unauthorized visitors?

The active areas of the facility must be completely enclosed [redacted]

[redacted]

CLOSING THE FACILITY

What will happen to the site when the facility ceases operations?

When the facility or any single waste management unit

has been approved by EPA. For a permitted facility, the closure plan is submitted with Part B of the permit application and becomes a part of the permit. For an interim status facility, the owner or operator submits a plan to EPA before closure begins. EPA makes this plan available to the public f

registered professional engineer must certify that the facility has been

For a facility operating only storage and incineration services, closure would involve the removal and proper disposal elsewhere of any wastes or waste

contact with wastes, such as blending and storage tanks and the incinerator itself. Because incineration is a treatment rather than a disposal process, closure of an incinerator would result in the removal of all hazardous wastes

adequately removed at the time of release, long term clean up measures (corrective action) would be required.

How does RCRA ensure that the owner/operator has funds available for closure?

RCRA regulations establish financial requirements to ensure that funds are

regulations describes several mechanisms for guaranteeing financial assurance for closure activities, including use of a trust fund, or a letter of credit, among others. All

of the facility's creditors to obtain these funds.

CHAPTER 6

POTENTIAL RISKS OF HAZARDOUS WASTE INCINERATION

[redacted]

that protect human health and the environment. This chapter outlines the risks

[redacted]

uncombusted organic compounds. The organic compounds consist of trace levels of the organic compounds in the hazardous waste feed as well as products of incomplete combustion (PICs) formed [redacted]

[redacted]

the environment.

How are risks from hazardous waste incineration estimated?

[redacted]

[redacted]

[redacted]

Risk assessments of hazardous waste incineration examine two factors--the

result of human exposure to a pollutant with a specified toxicity.

To measure the health risk from hazardous waste incinerator emissions, several steps must be taken. The first step is to measure emissions or to estimate them based on the incinerator's technical specifications (destruction

the assumptions are conservative, the risk assessment will tend to overestimate risks. Both conservative and nonconservative assumptions are commonly used. An example of a nonconservative assumption is that synergism between compounds does

lifetime exposures at the point of maximum ground level concentrations of pollutants (essentially assuming that individuals are exposed to the maximum

experience effects from exposure). On balance, EPA risk assessments are conservative by design, and will tend to overestimate risks.

compounds in emissions for a permitted hazardous waste incinerator range from one chance in 100,000 to one chance in 100,000,000 of contracting cancer over a

lifetime risk of one chance in 10,000 to one chance in 10,000,000. Levels of

[1] The World Almanac and Book of Facts, 1988; Editor, Mark S. Hoffman.

acceptability vary depending on the nature of the risks involved and the types

emitted from hazardous waste incinerators. EPA's principal measure of performance is destruction and removal efficiency (see chapter 2 for a more detailed discussion). A 99.99 percent DRE means that one molecule of a chemical

emissions, given the amount of waste which is burned. Only a very small

Although EPA regulations do not require owners or operators to perform risk

What are the risks involved during the transportation of hazardous waste to

to and from the vehicle.

EPA requirements for transporters cover emergency procedures and the use of

notify the proper authorities if an accident causing a release of hazardous

Chapter 5.)

chance of fire or explosion. For example, standards require isolating ignition sources from ignitable hazardous waste during storage and prohibit mixing incompatible substances. Incompatible wastes must be stored and treated separately so that there is no possibility of

plans for chemical mishaps.

RCRA regulations define standards ensuring containment of hazardous waste in

treated as necessary before being disposed.

CONTACTS FOR FURTHER INFORMATION

RCRA/Superfund Hotline

Toll Free (800) 424-9346

EPA Regional Offices

Region I	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	EPA Boston, MA 02203 (617) 573-9644
Region II	New Jersey, New York, Puerto Rico, Virgin Islands	EPA 26 Federal Plaza New York, NY 10278
		Chicago, IL 60604 (312) 353-0398
Region VI	Arkansas, Louisiana, New Mexico, Oklahoma, Texas	EPA 1201 Elm St. Dallas, TX 75270 (214) 655-6785
Region VII	Iowa, Kansas, Nebraska, Missouri	EPA 726 Minnesota Ave.
	Dakota, South Dakota, Utah, Wyoming	One Denver Place - Suite 1300 999 18th Street Denver, CO 80202-2413 (303) 293-1676

Region IX	Arizona, California, Hawaii, Nevada, American Samoa, Guam	EPA 215 Fremont St. San Francisco, CA 94105 (415) 974-8026
Region X	Alaska, Idaho, Oregon, Washington	EPA 1200 Sixth Ave. Seattle, WA 98101 (206) 442-1099

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GLOSSARY

Administrative order: An official, legally enforceable order issued by EPA to force a facility's owner or operator to address potential threats to human health and the environment resulting from activities at the facility, [illegible], and to perform monitoring, testing, and analysis.

Administrative record: All information gathered regarding an EPA action.

[illegible] The secondary combustion chamber of a rotary kiln incinerator.

[illegible]

[illegible] the allowable ranges specified in the permit.

[illegible] designed to capture and prevent release of particulates [illegible]

[illegible] hazardous wastes. The BDAT for a particular waste may change in the future as new advances in treatment technology [illegible]

[illegible] containing organic wastes are often mixed with oxygen, promoting both the growth of the microorganisms and their consumption of [illegible]

[illegible] category of hazardous waste treatment processes that use chemicals to remove dissolved inorganics or transform waste components to less toxic forms.

[illegible] regulations are contained in volume 40 of the Code of Federal Regulations.

combustion: The controlled burning of wastes. During combustion, heat is used to chemically alter the organic compounds in the waste. Combustion converts most of the organic compounds [illegible]

combustion chamber: The actual compartment [illegible]

[illegible] can demonstrate that a particular waste does not pose risks to human health and the environment, the waste can be delisted.

destruction and removal efficiency (DRE): A percentage that represents the number of molecules of a compound removed or destroyed in an incinerator relative to the number of molecules of the compound which entered the [illegible]

dibenzofurans: A group of highly toxic organic compounds [illegible]

dioxins: A group of highly toxic organic compounds that are often found [illegible]

draft permit: A preliminary permit drafted and published by EPA. The draft [illegible]

electrical charges to remove particulate matter from emission gases. The [illegible]

operating conditions specified in the facility's RCRA permit. EPA's [illegible]

that a pending structure or development will have on the environment. An EIS must be prepared by a government agency when a "major" federal action that will have "significant" [illegible]

permitting process and EPA's tentative decision with regard to a permit application.

Federal Register: A document published daily by the federal government containing notification of government agency actions. The Federal Register contains notification of EPA actions, including notification of EPA decisions concerning permit applications.

financial assurance for closure: Documentation or proof that an owner or operator of a facility is capable of paying the projected

flash point: The lowest temperature at which the vapors above a volatile

transport the waste, leaks through pipes and valves, and through operation of faulty equipment.

Although the legal definition of hazardous waste is complex, the term more

health and the environment caused by hazardous wastes.

inert: Lacking the ability to chemically react with other substances.

salts, and various carbon oxides (carbon monoxide, carbon dioxide). These compounds do not combust in incinerators, although incinerators may

construction or in operation by November 19, 1980, and can meet other

interim status facilities by November, 1989.

liquid injection incinerator: A commonly used incinerator that relies on high pressure to prepare liquid wastes for incineration. A pressure system forces liquid waste through a nozzle, "breaking" the liquid up into tiny

mobile incinerator systems: Hazardous waste incinerators that can be

incinerator facilities.

molten salt reactor: A type of thermal

National Environmental Policy Act (NEPA): A federal

Notice of Deficiency: A reply from EPA to a

Notice of Intent to Deny: Notification by EPA of its preliminary decision to deny a permit application.

operating conditions: Conditions specified in a RCRA permit that dictate how an incinerator must operate as it burns different waste types. These conditions are set by EPA on the

organic compounds: Compounds that contain carbon, hydrogen, and often oxygen. Organic compounds are combustible and can therefore be destroyed in an incinerator.

packed bed scrubber: An air pollution control device in which emissions pass

particulate matter: Material composed of tiny particles. For example, smoke is composed of gases and airborne particulate matter (soot).

PCBs: Polychlorinated biphenyls (PCBs) are highly toxic compounds. Incinera

limiting the concentrations of designated organic compounds, particulate matter, and hydrogen chloride in emissions from incinerators. Permit applicants must show that the incinerator can meet the performance standards under specific operating conditions specified in the RCRA permit.

monitored during an incinerator's trial burn. POHCs are selected based on their high concentration in the waste feed and their difficulty to burn relative to other organic compounds contained in the waste. For each waste feed, one or more POHCs may be designated.

public comment period: A specified amount of time allowed for members of the public to express their views and concerns regarding an action by EPA. The public comment period begins after EPA publishes a draft permit or a Notice of Intent to Deny.

public hearing: A formal gathering of EPA officials and the public where the

public notice: Notification by EPA informing the public of Agency actions, for example, the issuance of a draft permit. For draft permits, EPA must follow procedures to ensure proper public notice, including publication of the notice in newspapers and broadcast of the notice over radio stations

[redacted]

EPA to regulate hazardous wastes.

response to comments: A document that addresses all significant public comments received by EPA during the public comment period. The document includes a summary of each comment as well as EPA's response to each

[redacted]

subsequent occurrence of health effects.

rotary kiln incinerator: A type of incinerator that includes a rotating combustion chamber. The constant rotation of the combustion chamber keeps waste moving, allowing the wastes to vaporize (convert to gas) for easier burning.

secondary combustion chamber: The compartment or chamber immediately following the primary combustion chamber. Organic compounds partially combusted in the primary chamber are further combusted in the secondary combustion chamber.

sludge: A thick, heavy, mud-like mixture of solids and liquids often resulting from the settling of solids from a liquid.

slurry: A thin, watery mixture of solids and liquids. Slurries contain more

[redacted]

droplets into a chamber where the acid gas is also introduced. The small

[redacted]

water to break down large organic molecules into smaller, less toxic ones. Oxygen injected during this process combines with the simple

[redacted]

Superfund: The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) passed in 1980. A federal statute that gives [illegible] by the government.

thermal treatment: The use of elevated temperatures to treat hazardous wastes. Thermal treatment changes the chemical and/or physical composition of a waste. Types of thermal treatment include incineration and pyrolysis.

trial burn: A test for incinerators in which wastes are fed into the [illegible] Toxic Substances Control Act. The federal statute under which the incineration of PCBs is regulated.

[illegible]

generated during industrial production processes.

100-year floodplain: The [illegible]