



Project Summary

A Profile of Existing Hazardous Waste Incineration Facilities and Manufacturers in the United States

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A wide variety of technical data pertaining to hazardous waste incinerators has been obtained both from incinerator manufacturers and facilities operating hazardous waste incinerators. This document discusses the procedures for data gathering and verification and presents tabulations of the data. It is estimated that there are approximately 350 operational hazardous waste incinerators at 270 facilities in the United States that are subject to regulation under the Resource Conservation and Recovery Act.

This Project Summary was developed by EPA's Industrial Environmental Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction and Summary

Background

The control of hazardous waste (HW) continues to be of major concern to the U.S. Environmental Protection Agency (EPA). In response to Congressional legislation (Resource Conservation and Recovery Act [RCRA] of 1976, P.L. 94-580, as amended) EPA is developing a comprehensive control program to ensure proper handling of waste from its generation to ultimate disposal.

A major component of this program addresses the incineration of hazardous wastes. Incineration is considered "a proven method of destroying organic waste without posing a threat to the environment." Considering the amount of such waste which requires disposal, the amount of hazardous

wastes incinerated may increase by an order of magnitude or more.

Regulations governing hazardous waste incineration that were proposed on December 18, 1978, specify performance and operating standards. After public comment, these regulations were modified on January 23, 1981, to include only performance standards. The performance standards govern the emissions of hazardous waste constituents, hydrogen chloride, and particulate matter from incinerators.

While developing the regulations, the EPA identified a need for a technical data base correlating specific incinerator operating and design features with the ability to satisfactorily destroy hazardous wastes. The Incineration Research Branch (IRB) of EPA's Industrial Environmental Research Laboratory, Cincinnati, has a large, multifaceted program underway to develop such a data base. The objectives of this data base were enumerated as follows:

- (1) to support the current RCRA 3004 incineration regulations;
- (2) to provide direct technical support to regional permit and compliance programs;
- (3) to expand and refine the state of best engineering judgement regarding hazardous waste incineration; and,
- (4) to form the sound technical basis for development and promulgation of detailed design, performance and operating standards for hazardous waste incinerators in future revised regulations.

The MITRE Corporation is under contract to IRB to assist in the development of this hazardous waste incineration data base. Previous tasks on this contract included a user needs study and an analysis of existing

data management systems. As a result of these studies, a recommendation was made to IRB to concentrate development efforts on modifying and expanding EPA's existing Hazardous Waste Data Management System (HWDMS). This expanded portion of the data base is called the Hazardous Waste Control Technology Data Base (HWCTDB).

Current Effort

A major part of this effort centered on the collection of various types of hazardous waste incineration data in support of the IRB objectives. Two of the types of data collected were:

- Design features, operating characteristics, and number in-service estimates for hazardous waste incinerators based on contact with manufacturers of incinerators.
- Design information, operating conditions, and detailed waste characterization for operational hazardous waste incinerators based on information provided by HW facility spokesmen.

The full report presents the results of both of the data collection efforts. Section 2.0 of the full report discusses data collected from manufacturers of incinerators and related equipment. The data were used to generate a profile of the domestic hazardous waste incinerator manufacturing industry. In the full report, Section 3.0 discusses data collected from facilities known or thought to be possible operators of one or more hazardous waste incinerators, presents tabulations of the data collected, and discusses the findings. Both the manufacturers' data and the operational data were collected in part for entry into the HWCTDB.

Summary of Principal Findings

Incinerator manufacturers' information was obtained from interviews and sales literature provided by the 57 domestic companies identified as HW incinerator manufacturers. Information on existing facilities was obtained from 514 of 566 facilities listed in HWDMS as HW incinerators on 30 November 1981, plus 23 facilities identified outside the HWDMS data base. The summary findings presented below are based on the information provided by these 57 manufacturers and 537 facilities.

Table 1 presents a comparison of the number of HW incinerators as reported by both manufacturers and representatives of existing HW facilities. A total of 284 operational HW incinerators were verified at 219 facilities. At the end of this study a review of the HWDMS and other sources produced a list of 128 potential incineration facilities which had not been contacted. These included new additions to HWDMS, and

facilities which could not be contacted during the study. If a projection of the facility population figures is made to account for these 128 potential facilities, the total operational HW incinerator population would be approximately 350 units at 270 facilities. This figure agrees with the 335 operational units reported by manufacturers. In contrast, existing facilities reported 32 units under construction, which is much higher than the seven reported by manufacturers.

Table 2 presents a comparison of the types of operational HW incinerators reported by manufacturers and HW facilities. The manufacturers' data and the projected total existing populations agree for the liquid injection and hearth type incinerators. However, the rotary kiln population reported by manufacturers is more than double the number reported by facilities.

Of the 264 operational incinerators whose type was specified, 208 (79 percent) are capable of burning liquids by injection. Twenty-nine units (11 percent) are capable of burning bulk wastes (solids or liquids). The remaining units are mostly special purpose types such as steel drum reconditioning

burners or military ammunition disposal equipment.

Additional findings based on analyses of the existing facilities data include:

- Design capacities were reported for 180 incinerators burning liquids and 44 incinerators burning solids. The median design capacity of incinerators burning liquids is 150 gallons per hour with most units (86 percent) not exceeding 1000 gallons per hour. Incinerators burning solids tend to have smaller capacities with the median being approximately 650 pounds per hour (equivalent to 78 gallons of water).
- Of the 219 facilities reporting, 71 (32 percent) reported operating continuously 24 hours per day, 7 days per week. The majority of all incinerators (62 percent) reported intermittent operations either on a fixed schedule or an "as needed" basis. The remaining 13 units (6 percent) were on standby or long-term shutdown

*Since some respondents did not provide data on one or more topics, the sample size varies from one topic to another.

Table 1. Comparison of Number of HW Incinerators Reported by Manufacturers and HWI Facilities

| | Reported by HWI Facilities Contacted | | Reported by Manufacturers |
|---------------------------|--------------------------------------|---------------------------------|---------------------------|
| | Actual Number Reported | Projection for Total Population | |
| Operational Incinerators* | 284 | 350 | 335 |
| Units under Construction | 32 | 40 | 7 |
| Total Reported | 316 | 390 | 342 |

*Operational incinerators are defined as those currently burning hazardous waste or which are temporarily shut down for maintenance or other causes.

Table 2. Comparison of the Types of Operational HW Incinerators Reported by Manufacturers and HWI Facilities

| | Reported by HWI Facilities Contacted | | Reported by Manufacturers |
|--------------------|--------------------------------------|---------------------------------|---------------------------|
| | Actual Number Reported | Projection for Total Population | |
| Liquid Injection | 160 ^a | 213 | 219 |
| Hearths | 56 ^b | 75 | 70 |
| Rotary Kiln | 13 ^{b,c} | 17 | 37 |
| Fluidized Bed | 4 | 5 | 9 |
| Others | 31 ^d | 42 | (^e) |
| Type Not Specified | 20 | 0 | (^e) |
| Total Operational | 284 | 352 | 335 |

^aincludes fume/liquid units.

^bincludes units both with and without liquid injection.

^cincludes 2 rotary kilns in combination units.

^dincludes 3 combination units not having a rotary kiln.

^ethis category not obtained from manufacturers.

but still considered operational by the facility.

- Combustion temperatures were reported for 173 incinerators. Gaseous residence times were reported for 104 incinerators. The median combustion temperature for HW incineration is approximately 1800°F, and median gaseous residence time is slightly under 2 seconds. Units operating at higher temperatures also tend to have longer residence times.
- Most of the wastes reported are liquids, principally spent non-halogenated solvents and aqueous solutions of corrosives, reactives or ignitables. The most frequently reported waste was the non-listed ignitable waste with high heat content (over 6000 Btu per pound). This waste was reported for 69 incinerators. The largest single category of waste by weight was non-halogenated solvents, accounting for 233,000 tons per year at 18 incinerators. This is approximately 23 percent by weight of all wastes reported. However, approximately 600,000 tons per year (59 percent) of all wastes reported were aqueous hazardous wastes.
- Air pollution control devices (APCDs) were reported on 45 percent of the incinerators. Some form of scrubber system was used on 83 percent of the units with APCDs. Larger incinerators are more likely to have control devices than smaller units.
- Incinerators with high combustion temperatures and long gaseous residence times are more likely to have air pollution control devices than other units.
- Heat recovery units were reported on 22 percent of the incinerators. The use of heat recovery tends to be related to the continuity of incinerator operation.
- Although the data were not subjected to formal statistical analysis, there appears to be a correlation between the location of HW incinerator facilities and chemical industry centers. For example, of the 219 facilities identified, 52 (24 percent) are located in Texas or Louisiana.
- Privately owned and operated (on-site) facilities (including university facilities) account for 80 percent of the total. The remaining facilities are mostly commercial facilities or military ammunition disposal operations.
- Most of the incinerators (104 out of 128 reporting) are less than 10 years old. Sixty units (47 percent) are in the 6- to 10-year age range.
- Due to the structure of the data gathering and verification procedures, it was

not possible to estimate the extent to which hazardous waste may be incinerated in devices exempt from the RCRA HW incinerator regulations, such as boilers or process kilns.

The above capsule profile of HW incineration in the United States tends to substantiate many concepts which heretofore were mostly assumptions. These include the location, type, and capacities of HW incinerators. On the other hand, some previously existing assumptions will require modification. Among these are the number of facilities, the nature of wastes incinerated, and the hours of operation.

Many respondents voiced the opinion that the decision to operate an HW incinerator was selected only when other choices such as material recovery, recycling, energy recovery or other disposal methods were not cost-effective.

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C. C. Lee is the EPA Project Officer (see below).

The complete report, entitled "A Profile of Existing Hazardous Waste Incineration Facilities and Manufacturers in the United States," (Order No. PB 84-157 072; Cost: \$16.00, subject to change) will be available only from:

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