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Project Summary

Feasibility Study for Adapting Present Combustion Source Continuous Monitoring Systems to Hazardous Waste Incinerators

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The U.S. EPA is sponsoring research programs to investigate sampling and analysis methods for hazardous waste incineration. These investigations are focused on the adaptation of existing methods for identifying and quantifying constituents listed in the Code of Federal Regulations (40 CFR 261). As part of this program, the adaptability of existing continuous emission monitor systems (CEMS) to hazardous waste incineration sources was investigated. Measurement categories of interest include SO_2, NO_x, CO, CO_2, O_2, HCl, and organic materials. This report focuses on commercially available sample conditioning and measurement systems, and gives results of this adaptability study in the form of a guidelines document to be used by EPA and industry personnel.

Study results indicate that commercially available extractive continuous monitors can be adapted to incinerators through proper sample conditioning. Conventional sample conditioning systems that dry and remove particulate matter from the sample gas should be constructed to withstand HCl gas concentrations of up to 17 percent v/v and temperatures reaching 1700°C (3000°F). Available continuous monitoring instrumentation provides the ranges and sensitivities needed to accurately measure concentrations of the organic and inorganic components of interest.

This Project Summary was developed by EPA's Industrial Environmental Research Laboratory, Research Triangle Park, NC, 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

Proper disposal of hazardous wastes is one of the key environmental problems of this decade. To address this problem, the U.S. Congress in 1976 passed Federal Law 94-580, the Resource Conservation and Recovery Act (RCRA). Regulations promulgated under the authority of this legislation established the framework for a strong federal hazardous waste management program (U.S. EPA, Regulations for Hazardous Waste Management, 40 CFR, Parts 260-265, 267). These regulations define wastes that are hazardous and set standards for waste generators, transporters, and hazardous waste management facilities. In addition, the hazardous waste regulations set forth applicable physical, chemical, biological, and thermal processes that can be used to treat hazardous wastes.

The U.S. EPA estimates that in 1979 only 5 percent of the total hazardous waste stream in the U.S. was disposed of by incineration, yet 60 percent of the total wastes could have been successfully destroyed using current incinerator technology.

Supporting an incineration research program of EPA's Industrial Environmental Research Laboratory at Cincinnati (IERL-Cin), the Agency's Industrial Environmental Research Laboratory at Research Triangle Park (IERL-RTP) began

to investigate sampling and analytical methods. These investigations focus on the adaptation of existing methods for identifying and quantifying the components listed in regulations for hazardous waste management (40 CFR 261, Subtitle C).

Objectives and Approach

This task investigates the areas of inorganic and organic continuous monitoring, specifically the feasibility of adapting commercially available extractive continuous emissions monitoring systems (CEMS) for use on hazardous waste incinerator sources and providing a user's guidelines manual to assist in the selection of monitoring equipment. The investigation was restricted to instrumentation for measuring SO_2, NO_x, CO, CO_2, O_2, HCl, and hydrocarbons.

The program was conducted in two segments. Initially an engineering assessment of current incinerator technology was conducted to define the environment in which a hazardous waste incinerator CEMS must operate. Ranges of expected temperatures, pressures, and flue gas constituents were developed for the three generic regions within an incinerator system: the combustion zone, before the air pollution control device, and after the air pollution control device.

The second segment involved determining the adaptability of available combustion measurement systems for the three sample locations. Principles of sample conditioning methods and inorganic and organic analyzer detection techniques were reviewed. Available equipment was surveyed by contacting instrumentation vendors and operators or owners of commercial hazardous waste incinerators.

Detailed results of the program are in a two-volume report. Volume 1 gives results of the adaptability study and guidelines for designing and selecting a CEMS for use on incinerators.

Volume 2 gives an analysis of the characteristics of RCRA-listed hazardous wastes and introduces data on the design and performance characteristics of three types of incinerators--liquid injection, rotary kiln, and fluidized bed. In addition, control device information and a detailed summary of the conditions and concentrations to be expected in the three zones of interest are given. Pertinent conclusions are given in the final section of Volume 2.

Conclusions

The sample conditioning system, if properly designed and maintained, will allow adaption of commercially available continuous gas monitors to hazardous waste incinerators. Conventional combustion and ambient monitors provide the appropriate ranges and sensitivities considering present performance requirements and anticipated concentration ranges. High concentrations of HCl gas and moisture are prime considerations in the design of a sample conditioning system. Temperatures of up to 1700°C in the combustion zone monitoring location also require consideration when selecting materials of construction. Ceramics and Hastelloy of Inconel steels are the construction materials of choice. Conditioning system designs should include an extractive probe and coarse filter followed by a moisture trap, fine filter, and a drying step prior to instrumental sample analysis. In some cases, acid gas concentrations can be reduced without affecting the sample constituents. More data are needed to establish the effects of typical acid gas removal mechanisms (by bubbler, absorber) on the integrity of SO_x, NO_x and organic species.

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The complete report consists of two volumes, entitled "Feasibility Study for Adapting Present Combustion Source Continuous Monitoring Systems to Hazardous Waste Incinerators:"
"Volume 1. Adaptability Study and Guidelines Document," (Order No. PB 84-187 814; Cost: $11.50)
"Volume 2. Review and Estimation of Incineration Test Conditions," (Order No. PB 84-187 806; Cost: $11.50)
The above reports will be available only from: (cost subject to change)
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650
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