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Project Summary

Test Report for the Trial Burn of Dionseb in a Pilot-Scale Incinerator

Mitchell Wool, Frank Villa, Howard Mason, and Donald Oberacker

This Project Summary synopsizes a brief (16 page) final report on the incineration behavior of a cancelled pesticide, dinoseb. Dinoseb exists as a large volume (2 to 4 mil gal) of Resource Conservation and Recovery Act (RCRA) waste, type P-020. The pesticide was cancelled in recent years because the U.S. Environmental Protection Agency (EPA) determined its continued use in agriculture represented an imminent health hazard in terms of its cancer-causing properties as well as its effects on human reproductivity. The EPA, in its process of finding disposal methods for this waste, determined that incineration would be the optimum technology except for concerns over the potential nitrogen oxide (NO_x) emissions that may result. Consequently, before proceeding with full-scale incineration of all inventories, EPA conducted a brief trial burn of a sample dinoseb mixture to quantify NO_x levels and also to ascertain that acceptable levels could be achieved for destruction and removal efficiency (DRE), particulate emissions, and other combustion behavior.

The trial burn demonstrated that, indeed, incineration would be an effective, safe, and satisfactory method for disposal. Based on the tests described herein, and subsequent full-scale demonstration testing, EPA then proceeded with contract disposal of dinoseb by the commercial incineration industry.

This Project Summary was developed by EPA's Risk Reduction Engineering 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

As part of a program by the EPA Office of Research and Development (ORD) to determine which technically viable disposal option is appropriate, the Environmental Systems Division of Acurex Corporation conducted pilot-scale test burns of a mixture of dinoseb products at the John Zink Company Research Incineration Facility in Tulsa, Oklahoma. The mixture represented the dinoseb products that were to be destroyed. The rationale for doing the pilot-scale test was that specific performance data were needed to address, with confidence, any public or permitting questions that might arise in authorizing the full-scale disposal operation.

The sampling and analysis methods were configured to characterize influent and effluent streams and to quantify the incinerator operating conditions. The specific objectives of the test burns were:

- Confirm that DRE of dinoseb is better than 99.99% at typical waste incinerator operating conditions,
- Determine the portion of nitrogen in the dinoseb mixture converted to NO_x in the combustion products,
- Determine the particulate emission characteristics of the dinoseb mixture, and
- Survey the combustion products for hazardous semi-volatile or volatile products of incomplete combustion.

Pilot-scale incineration testing was also needed so that interested parties could assess and project basic incineration parameters associated with destroying the dinoseb products.

The test burn plan was completed in December 1987, and the Quality Assurance Project Plan was approved in February 1988. The test burns were successfully performed between February 18 and February 26, 1988.

Facility Description

Tests were performed in a conventional 2 mil Btu/hr liquid injection incinerator at the John Zink Company Research Facility. The system consisted of a horizontal combustion chamber followed by two vertical, water-quenched transfer sections and assorted ducting to downstream pollution control equipment.

Feed Materials Characteristics

The nominal dinoseb mixture fed to the incinerator consisted of 82% Dyanap, 16% Dynamyte 3, and 1.6% Dynamyte 5. The Dyanap contains about 12% dinoseb salts. The Dynamyte 3 and 5 consists of 51% and 54% dinoseb, respectively. All of the dinoseb products were delivered to John Zink's facility in Tulsa, Oklahoma, in 30-gal containers.

According to the manufacturer, Dyanap is a mixture of dinoseb, dinoseb salt, a herbicide called naptalam, other constituents, and water. The common name of Naptalam is sodium alanap or N-1-naphthylphthalemic acid. It represents about 22% of the Dyanap. The Dyanap mixture is a dark red liquid with a phenolic odor and a specific gravity close to water. Dyanap material tends, however, to become very viscous and solidify below 10°C. The other dinoseb formulations, Dynamyte 3 and 5 from Drexel, are very stable even at temperatures below 10°C.

For the test burns, the waste mixture was prepared by blending the three dinoseb products (Dyanap, Dynamyte 3, Dynamyte 5) into an agitated mix tank in a 5:1:0.1 volumetric ratio to produce a waste with a dinoseb or dinoseb salt composition of 16% to 20% by weight. A sample of this mixture was prepared in the laboratory and kept at ambient temperature of about 20°C.

The sample remained homogeneous with no visible signs of immiscibility over a period of more than a month. As long as the mixture is above 20°C, it seems to be easily pumped, agitated, and injected into the incinerator. During testing, ambient temperature was below freezing, so the mixture needed to be heated to remain pumpable.

Operating Conditions

The primary operating parameters for the test burns were the incinerator exit temperature and the dinoseb mixture feedrate. Flue gas was sampled both before and after the particulate scrubber pollution control device at the ports.

The incinerator was fired primarily on natural gas with relatively small amounts of heating provided by the dinoseb mixture. Estimated heating value of the mixture is 2,485 cal/gm (4,473 Btu/lb).

Sampling and Analysis Methods

Sampling and analysis were conducted in accordance with an EPA Category II Quality Assurance Project Plan (QAPP). Methods generally followed those given in *Test Methods for Evaluating Solid Waste* (SW-846, Third Edition, November 1986). Specific deviations were needed in some cases and are documented in the QAPP.

Dinoseb Destruction and Removal Efficiency

The DRE of the dinoseb mixture in the John Zink incinerator system was evaluated by conducting standard Modified Method 5 (MM5) sampling at the flue gas ducts (Method 0010 of SW-846). Analyses generally followed the protocol, although, during method validation activities, the extraction process was changed to use acetone rather than methylene chloride. In the validation work, dinoseb recovery exceeded 70%.

Results

No dinoseb was detected in any c flue gas samples. In all cases, dinoseb DRE exceeded (was better 99.999%.

NO_x Production

The feed mixture contained 3.1 w percent nitrogen on a dry basis. nitrogen comes from the dinc dinoseb salt, Naptalam, diethanolamine.

The NO_x concentrations in the flu were analyzed continuously usinç nondispersive infrared analyzers: detected only NO and the se detected total NO_x. In general differences in readings were smalle the uncertainty in measurement.

Various levels of NO_x were mea during incineration; these are pre: in detail according to location i incinerator and test conditions in th report. The values, however, range(150 to as high as 1011 parts per (ppm) in the combustion gases or exhaust stack, as corrected t oxygen levels. Values of NO_x me: without any dinoseb flowing, resulted simply from firing natur: alone with combustion air, ranged 150 ppm.

Other Results

Particulate measurements show(with a common design of a wet sc although dinoseb produces a re heavy loading of nearly 700 mil per dry standard cubic meter (mg the stack gas loading after scrubbi controlled to less than 35 mg which was well under the performance standard of 180 mg/d

Products of incomplete comI (PICs) were sampled and analyzec the PICs detected, however, neit volatile or the semi-volatile type found to be of any unusual type o level of concern in the stack gas.

Conclusion

Incineration proved an effectiv and satisfactory method for disp the cancelled pesticide dinoseb.

The full report was submi fulfillment of Contract No. 68-03- Acurex Corporation und sponsorship of the U.S. Enviro Protection Agency.

Mitchell Wood, Frank Villa, and Howard Mason are with Acurex Corporation, Mountain View, CA 94039; and **Donald Oberacker** *(also the EPA Project Officer, see below), is with the Risk Reduction Engineering Laboratory, Cincinnati, OH 45268.*

The complete report, entitled "Test Report for the Trial Burn of Dionseb in a Pilot-Scale Incinerator," (Order No. PB 89-198 790/AS; Cost: $13.95, subject to change) will be available only from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: 703-487-4650

The EPA Project Officer can be contacted at:

Risk Reduction Engineering Laboratory
U.S. Environmental Protection Agency
Cincinnati, OH 45268

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Cincinnati OH 45268

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