



Project Summary

At-Sea Incineration of PCB-Containing Wastes Onboard the M/T VULCANUS

D.G. Ackerman, J. F. McGaughey, and D.E. Wagoner

This report describes tests during the incineration-at-sea of a shipload of polychlorinated biphenyls (PCBs) onboard the M/T VULCANUS, during August 1982 in the Gulf of Mexico. A standard EPA-specified sampling train was used to acquire samples of the effluent combustion gases. A fixed-position water-cooled probe, in the starboard incinerator, directed stack gas to the train. Ten tests were performed. Samples of the waste were also taken during each test. Samples were analyzed on land for PCBs, chlorobenzenes, tetrachlorodibenzofurans (TCDFs), and tetrachlorodibenzo-p-dioxins (TCDDs). Other test related activities included wipe-sampling and onboard analysis of these samples, acquisition of samples of work space air in the incineration control room and the dining room, and acquisition of pertinent process related data. The various measures of performance met or exceeded requirements of the permit. Incinerator walls averaged 1303°C, oxygen 10.1 percent, carbon dioxide 9.1 percent, carbon monoxide 8 ppm, combustion efficiency 99.99 percent, and destruction efficiencies greater than 99.99 percent for PCBs and chlorobenzenes and greater than 99.9 percent for TCDFs.

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

Thermal destruction of combustible wastes at sea is an alternative to land-based incineration. In August 1974, March 1977, and July-September 1977, testing sponsored by U.S. Environmental Protection Agency (EPA) was performed while the M/T VULCANUS was burning organochlorine wastes. Results of these tests were evaluated by the EPA: it was concluded that oceanic incineration was an environmentally acceptable and cost-effective alternative to other means of disposal.

The first at-sea incineration of wastes containing polychlorinated biphenyls (PCBs) was performed in U.S. waters under EPA permit HQ-81-002 during December 1981 - January 1982. The wastes were burned on the incinerator ship M/T VULCANUS, operated by Ocean Combustion Service (OCS) BV, Rotterdam, The Netherlands. The wastes were supplied by Chemical Waste Management (CWM), Inc., Oak Brook, IL, from its facility in Emelle, AL. CWM and OCS were the permittees. OCS is a wholly owned subsidiary of CWM.

During August 15-31, 1982 a second shipload of PCB-containing wastes supplied by CWM was incinerated by the M/T VULCANUS, also under research permit HQ-81-002. EPA sponsored a test project during this second burn, and this document reports the results of testing to measure emissions of unburned PCBs, chlorobenzenes (CBs), tetrachlorodibenzofurans (TCDFs), and tetrachlorodibenzo-p-dioxins (TCDDs).

Summary of Results

Incineration occurred in the Gulf of Mexico at-sea incineration site designated

by EPA for oceanic incineration. The site is centered 315 km (196 mi) SSE of Galveston, TX, and 350 km (217 mi) S of Cameron, LA, and occupies an area of about 4,900 km² (1,890 mi²). Incineration operations started on August 17 and were completed on August 29. The cargo was 3,523 metric tons (mt) (3,883 tons) in weight and 3,031 m³ (801,000 gal.) in volume. Incineration operations required 282 hours and a total of 3,507 mt was destroyed.

A standard EPA-specified sampling train was used to acquire samples of the effluent combustion gases. A fixed-position water-cooled probe, mounted in the starboard incinerator, directed stack gas to the train. Ten tests were performed. Samples of the waste were also taken during each test. Samples were analyzed on land for PCBs, chlorobenzenes, tetrachlorodibenzofurans (TCDFs), and tetrachlorodibenzop-dioxins (TCDDs) by the University of Nebraska, Lincoln, NE, and the Environmental Monitoring Systems Laboratory of EPA, Research Triangle Park, NC (EMSL-RTP).

Other test-related activities included wipe-sampling and onboard analysis of these samples, acquisition of samples of work space air in the incineration control room and the dining room, and acquisition of pertinent process-related data.

The various measures of performance met or exceeded requirements of the permit. Incinerator wall temperatures averaged 1303°C, oxygen 10.1 percent, carbon dioxide 9.1 percent, carbon monoxide 8 ppm, combustion efficiency 99.99 percent, and destruction efficiencies greater than 99.99 percent for PCBs and chlorobenzenes and greater than 99.9 percent for TCDFs.

The full report describes the M/T VULCANUS and the testing, gives results of the test operations and analyses, and presents destruction efficiencies. There are nine appendices: voyage report of the Chief Engineer, example calculations, selected portions of research permit HQ-81-002, evaluation of a heat-traced Teflon line, procedures for cleaning glassware, EPA summary of analyses of TCDFs and TCDDs, EPA report on the quality assurance effort on the analyses of TCDFs and TCDDs, University of Nebraska-Lincoln report on the analyses of test samples for TCDFs and TCDDs, and Research Triangle Institute report on the quality assurance effort on the analyses of audit samples for PCBs.

D. Ackerman, J. McGaughey, and D. Wagoner are with TRW, Inc., Redondo Beach, CA 90278.

Merrill D. Jackson is the EPA Project Officer (see below).

The complete report, entitled "At-Sea Incineration of PCB-Containing Wastes Onboard the M/T VULCANUS," (Order No. PB 83-207 647; Cost: \$23.50, 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:
Industrial Environmental Research Laboratory
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711*

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