On-Site Incineration at the
Vertac Chemical Corporation Superfund Site
Jacksonville, Arkansas

Incineration at the Vertac Chemical Corporation Superfund Site Jacksonville, Arkansas

<table>
<tr><td>Site Name:
Vertac Chemical Corporation Superfund Site</td><td rowspan="2">Contaminants:
Dioxins and Volatile Organic Compounds

• TCDD; chlorinated benzene; chlorinated phenols; 2,4-D; and 2,4,5-T.
• TCDD concentrations up to 50 mg/L</td><td>Period of Operation:
January 1992 - September 1994</td></tr>
<tr><td>Location:
Jacksonville, Arkansas</td><td>Cleanup Type:
Remedial action</td></tr>
<tr><td>Vendor:
MRK Industries</td><td rowspan="2">Technology:

On-Site Incineration
• Solids pretreated by triple rinsing, shredding, and drying
• Incineration system consisting of rotary kiln and secondary combustion chamber (SCC)
• Enclosed conveyor transported contaminated material to the unit
• Residence time was approximately 40 minutes, kiln temperature of 2,000 ^{o}F and SCC temperature of 2,200 ^{o}F
• Treated materials (incineration ash and residual) were collected and disposed of off site in a Subtitle C hazardous waste disposal facility.</td><td>Cleanup Authority:
CERCLA, SARA, RCRA, and State: Arkansas
• ROD Date: NA
• State-lead</td></tr>
<tr><td>SIC Code:
2879 (Pesticides and Agricultural Chemicals)</td><td>Point of Contact:
Mike Arjmandi
Arkansas Department of Pollution Control & Ecology
P.O. Box 8913
8001 National Drive
Little Rock, AR
72219-8913
(501) 682-0852</td></tr>
<tr><td>Waste Source:
Drummed still bottom waste - herbicide manufacturing waste</td><td colspan="2" rowspan="2">Type/Quantity of Media Treated:
Storage Drums, Drummed Waste, and Soil
• 9,804 tons of waste
• 1,027 tons of soil</td></tr>
<tr><td>Purpose/Significance of Application:
Two temporary restraining orders were filed to stop the incineration project over public concern about the incinerator</td></tr>
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Incineration at the Vertac Chemical Corporation Superfund Site Jacksonville, Arkansas

(Continued)

Regulatory Requirements/Cleanup Goals:

- Destruction and Removal Efficiency (DRE) of 99.9999% for all constituents of concern as required by Resource Conservation and Recovery Act (RCRA) incinerator regulations, 40 CFR part 264, subpart O.

Results:

- Emissions and trial burn data indicated that all DRE and emissions standards were met.

Cost Factors:

The incineration system at the site consisted of a rotary kiln and a secondary combustion chamber, followed by an air pollution control system.

Description:

Between 1948 and 1987, the Vertac site operated as a herbicide manufacturer within the city limits of Jacksonville, Arkansas. The by-product TCDD was placed in drums and stored on-site. Investigations at the site conducted by the U.S. EPA and the Arkansas Department of Pollution Control and Ecology (ADPC&E) as part of Vertac's participation in the 1978 National Dioxin Survey revealed TCDD concentrations as high as 40 mg/L in production wastes and eventually resulted in the site being placed on the National Priorities List (NPL) in 1983.

A Consent Decree was entered into by EPA, ADPC&E, and two RPs in January 1982, which required an independent consultant to assess the management of wastes being stored on the site and to develop a proposed disposal method. The proposed remedy was implemented in the summer of 1984 by court order over the objection of EPA who deemed the proposal unsatisfactory.

On-site incineration began in January of 1992 and was completed in September 1994.

EXECUTIVE SUMMARY

This report presents cost and performance data for the application of on-site incineration at the Vertac Chemical Corporation (Vertac) Superfund site in Jacksonville, Arkansas. A rotary kiln incinerator was operated from January 1992 through September 1994 as part of a remedial action. Contaminants of concern at the site included 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD); 2,4-dichlorophenoxyacetic acid (2,4-D); 2,4,5-trichlorophenoxacetic acid (2,4,5-T); chlorinated benzene; and chlorinated phenols.

The Vertac site was a former pesticide manufacturing plant which operated from 1948 until it was abandoned in 1987. During this period, approximately 29,000 drums of still-bottom waste from the production process were generated and stored on site. The drummed waste at Vertac contained solvents and TCDD. During the remedial investigation, TCDD concentrations were measured as high as 50 mg/L in the still bottom wastes and 2,800 µg/kg in the soil.

In 1987, the Arkansas Department of Pollution Control and Ecology (ADPC&E) determined that it would contract for the incineration of the drummed wastes, and would finance the action using a trust fund and letter of credit provided by one Potentially Responsible Party (PRP) at the site. Applicable regulations under the Resource Conservation and Recovery Act (RCRA) required a 99.9999% destruction and removal efficiency (DRE) for dioxin listed wastes.

ADPC&E conducted remedial activities including the operation of a rotary kiln incinerator to disposed of the drummed wastes until June 1993, when EPA assumed management responsibilities at the site. The incineration system used at Vertac was comprised of a direct-fired rotary kiln, two cyclone separators, a secondary combustion chamber (SCC), a baghouse, a wet scrubbing system, and ash removal facilities.

The waste drums were opened, emptied, and rinsed in an enclosed building maintained at a negative pressure. Waste from the drums was fed to the incinerator. Wastewater generated was treated and recycled in a closed system. Ash from the incinerator was discharged to storage drums while off-gas from the kiln was routed to the cyclone separators.

The cyclone separators removed particulates, which were routed to the waste feed system and re-incinerated, and discharged the gas to the SCC. The SCC provided further oxidation of the remaining organic contaminants in the gas.

Treated gas was drawn through an air pollution control system (APCS), which consisted of a spray drier, to lower the temperature of the gas, and a baghouse assembly, venturi scrubber, and baffle absorption scrubber to remove additional particulates. The gas was then discharged to the atmosphere. Ash collected from the incinerator and scrubbers was disposed of at a Subtitle C hazardous waste disposal facility.

During the 32 months of operation, the incinerator processed 9,804 tons of waste. Additionally, approximately 1,200 tons of 2,4,5-T waste was incinerated at an off-site facility. Treatment performance and emissions data collected during this application indicated that all performance standards and emissions requirements were achieved.

The actual cost for remediation using the incineration system was approximately $31,700,000. This amount consisted of approximately $21,000,000 in capital costs and approximately $10,700,000 in operating costs.

SITE INFORMATION

Identifying Information

Vertac Chemical Corporation Superfund Site
Jacksonville, Arkansas

CERCLIS # ARD000023440

ROD Date: Not applicable

Treatment Application

Type of action: Removal (on-site rotary kiln incineration)

Period of operation: January 1992 - September 1994

Quantity of material treated during application: 9,804 tons of still bottom waste, soil, and debris

Background

Historical Activity that Generated Contamination at the Site: Manufacture of herbicides

Corresponding SIC Code: 2879 (Pesticides and Agricultural Chemicals)

Waste Management Practice That Contributed to Contamination: Improper waste storage and disposal practices

Site History:

- The site operated from 1948 until it was abandoned in 1987. The Vertac site is located within the city limits of Jacksonville, Arkansas, which has 28,000 residents. Approximately 1,000 people live within one mile of the site, which is bounded by residential areas to the east and south, Little Rock Air Force base to the north, and an industrial area to the west.
- During this period, herbicides, primarily 2,4-D and 2,4,5-T, were manufactured at the site. TCDD was a by-product of the manufacturing process. The drummed still bottom wastes generated in the manufacturing process were stored on site.
- The Vertac site participated in the 1978 National Dioxin Survey. TCDD concentrations as high as 40 mg/L were found in the 2,4-D and 2,4,5-T production wastes. EPA and ADPC&E began investigations at the site, resulting in the site eventually being placed on the National Priorities List (NPL) in 1983. ADPC&E issued an order in 1979 which required the operators of the site to improve hazardous waste handling practices [1].
- During site investigations, TCDD concentrations in the 2,4,5-T drummed waste were measured as high as 50 mg/L. TCDD concentrations in the 2,4-D waste were generally less than 1 µg/L. All of the waste on site, however, was classified acutely hazardous waste (see the dioxin listing rule of January 14, 1985 (50 FR 1978)).
- A Consent Decree was entered into by EPA, ADPC&E, and two PRPs in January 1982, which required an independent consultant to assess the management of wastes being stored on the site and to develop a proposed disposal method. The proposed remedy was implemented in the summer of 1984 by court order over the objection of EPA who deemed the proposal unsatisfactory [1].
- The remedy specified by the Consent Decree required that the site's cooling water pond and equalization basin be closed and the sediments from these areas be placed in an unlined excavated area where waste had previously been buried. The remedy specified that a French drain, leachate collection system, and monitoring wells be installed around the area and required the area to be capped.

SITE INFORMATION (CONT.)

Background (Cont.)

- A series of treatability studies using Vertac wastes were performed in 1985 at the EPA Combustion Research Facility in Jefferson, Arkansas to determine if a 99.9999% DRE was achievable. The tests showed that incineration was viable based on this criterion, and in 1985 the RP operating the site contracted with Environmental Services Company (ENSCO) to incinerate the wastes.
- Later in 1985, EPA and ADPC&E entered into an agreement with the RP operating the site, under the terms of which the RP established a trust fund and a letter of credit for environmental remediation.
- In 1986, after several unsuccessful trial burns, ENSCO left the site. In January 1987, the RP declared bankruptcy and abandoned the site. The trust fund that had been established continued to fund remedial action through 1993.
- When the site was abandoned, nearly 29,000 55-gallon drums of still bottom production wastes remained on site. Approximately 25,600 of these drums contained waste from 2,4-D production and about 3,200 others contained waste from 2,4,5-T production. The drums contained high concentrations of solvents (for example, toluenes and phenols), had an average chlorine content of 25%, and had a pH in the 2 - 3 range. In addition, 650 tons of contaminated sludges, liquids, and solids were abandoned in approximately 100 of the 190 production tanks that had been used in the manufacturing process.
- EPA and ADPC&E also discovered that many of the drums and production tanks were leaking presumably as a result of the corrosivity of the waste and ultraviolet degradation. EPA issued a work order to the site which instructed them to fix the leaking tanks and clean up the spills.
- The contaminated soil at the site was addressed in a separate operable unit. It was excavated and landfilled in a Subtitle C facility.
- In February 1987, EPA and ADPC&E initiated an immediate removal action to mitigate the hazards posed by the deterioration of the drums. The drums were placed in 85-, 110-, and 130-gallon overpack drums, and placed in a covered storage area.
- In 1987, ADPC&E awarded a contract to MRK Industries using funds from the trust for the incineration of the waste at the Vertac site. A trial burn was conducted from August 30, 1990 until December 10, 1990. A second trial burn was required due to several problems with the first trial burn. ADPC&E cited problems with surrogate spike recoveries for semi-volatile compounds, data gaps for recorded parameters, and laboratory QA/QC procedures as the reasons for a second trial burn [1].
- In September 1990, Records of Decision (RODs) were signed for the Jacksonville Municipal Landfill and the Rogers Road Municipal Landfill, which called for the excavation and incineration at the Vertac site of contaminated soils. Both landfills were located in Jacksonville, approximately five miles from the site and had been contaminated by waste from the Vertac site. A total of 1,027 tons of landfill soil and debris was transported to Vertac and incinerated.

SITE INFORMATION (CONT.)

Background (Cont.)

- On May 29, 1991 a motion was filed by several organizations for a preliminary injunction to halt the incineration of the drummed hazardous wastes at the site. The organizations claimed that the incineration would cause irreparable damage to the community of Jacksonville. After court testimony, the injunction was dissolved and incineration was allowed to continue.

- The second trial burn was conducted October 9 through 11, 1991 and the results were approved by ADPC&E. Incineration of the 2,4-D waste began in January 1992.

- On October 28, 1992, the Government Accountability Project (GAP) filed a petition in Federal District Court requesting a temporary restraining order and temporary injunction against burning the 2,4,5-T waste at the Vertac site. On October 29, 1992, the court granted the restraining order, but allowed ADPC&E five days in which they could burn 2,4,5-T waste to gather emissions data.

- On October 29 through 31, 1992, ADPC&E incinerated approximately 80 drums of 2,4,5-T waste. Data gathered from the three day test showed dioxin and furan emissions to be approximately the same as emissions from the earlier 2,4-D incineration.

- On November 16 and 17, 1992, ADPC&E conducted three stack tests using Method 23 in 40 CFR part 60 to quantify emissions of dioxins and furans emitted during 2,4,5-T incineration. Results showed that mass emissions of dioxins and furans as TCDD equivalents were less than detected during the second trial burn. ADPC&E resumed the incineration of the 2,4-D waste following the completion of the stack tests.

- ADPC&E managed the 2,4-D incineration until June 1993 when the remedial contract was terminated because the funds from the trust had been exhausted. EPA took over responsibility for the site and resumed the incineration.

- Although the results of the incineration test with the 2,4,5-T waste demonstrated that the emissions were similar to those from the incineration of the 2,4-D waste, EPA decided in 1994 to transport the 2,4,5-T waste off site for incineration. The decision to incinerate the 2,4,5-T waste off site was based on (1) the fact that on-site incineration would have been more expensive and (2) ADPC&E's desire to finish the remediation of the site more quickly.

- On-site incineration of the 2,4-D waste at Vertac concluded in September 1994. Subsequently, approximately 3,200 drums of 2,4,5-T waste were transported to the Aptus incinerator in Coffeyville, Kansas until March 1996. The incineration of this waste was completed in April 1996.

- MRK processed 9,804 tons of waste between January 1992 and September 1994.

- Off-site disposal of 33,972 drums of incinerator salt and ash residuals was completed in December 1996. The residual was disposed of at the Highway 36 Land Development Company, Subtitle C facility, in Deer Trail, Colorado [2].

Regulatory Context:

- In 1983, the Vertac site was placed on the NPL.

- Remedial activities at the site were conducted under the provisions of two Remedial Actions.

- The selected remedy was consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Contingency Plan (NCP) 40 CFR Part 300 [3].

SITE INFORMATION (CONT.)

Background (Cont.)

- The DREs were set in accordance with RCRA standards, at 40 CFR part 264, subpart O.

Remedy Selection: On-site incineration was selected as the remedy for drummed waste at the Vertac Superfund site based on treatability study results and long-term economic considerations.

Timeline

Table 1. Timeline [1]

Date	Activity
1948 - January 1987	Vertac site manufactured herbicides
1978	National Dioxin Survey
1983	Site placed on the NPL
1984 - July 1986	Proposed interim remedy implemented
1985	Incineration pilot studies were conducted
February 1987	Emergency drum overpacking
August 1990 - December 1990	First Trial Burn
October 9-11, 1991	Second Trial Burn
January 1992	Incineration of drummed wastes began
June 1993	EPA assumed management of the site
September 1994	On-site incineration completed and remaining waste transported off site for incineration
March 1996	Transport to off-site incinerator was completed
December 1996	Off-site disposal of residual salt and ash was completed

Site Logistics/Contacts

Site Management: EPA-lead

Oversight: ADPC&E

Remedial Project Manager:
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8001 National Drive
Little Rock, Arkansas 72219-8913
(501) 682-0852

Treatment System Vendor:
MRK Industries
Address NA

MATRIX DESCRIPTION

Matrix Identification

Type of Matrix Processed Through the Treatment System: Still-bottom waste from the production of 2,4-D and 2,4,5-T; soil and debris

- The composition of the drummed waste varied, but most of the drums contained a mixture of solids, liquids, and sludges [1].
- Soil and debris from off-site landfills.

Contaminant Characterization

Primary Contaminant Groups: Dioxins and Volatile Organic Compounds

- The contaminants of greatest concern were: TCDD; chlorinated benzene; chlorinated phenols; 2,4-D; and 2,4,5-T.
- The maximum concentrations detected in the still bottom waste in mg/L were TCDD (50); chlorinated benzene (NA); 2,4-D (NA); and 2,4,5-T (NA).

Matrix Characteristics Affecting Treatment Costs or Performance

The matrix characteristics of the drummed still bottom waste that most significantly affect cost or performance at the site and their measured values are presented in Table 2.

Table 2. Matrix Characteristics [4]

Parameter	Value
pH	2 - 3
Average chlorine content	25%
Average heat content (solids)	7,500 BTU/lb
Maximum heat content (organic liquids)	10,500 BTU/lb

TREATMENT SYSTEM DESCRIPTION

Primary Treatment Technology

Incineration system including:

- Waste feed system
- Rotary kiln
- Secondary combustion chamber

Supplemental Treatment Technology

Pretreatment (solids):

- Suction lance
- Two-stage shredder
- Mixing with corncobs

Post-Treatment (air):

- Cyclone separator
- Wet scrubbers

Post-Treatment (water);

- Carbon adsorption
- Evaporation

TREATMENT SYSTEM DESCRIPTION (CONT.)

System Description and Operation

- Drums were delivered to the feed preparation building on a flatbed truck, which could carry approximately 12 drums. The drums were removed from the truck and placed on a rolling conveyor, where the drums were weighted and subsequently transported into the feed preparation building. The building was maintained at a negative pressure to prevent fugitive emissions; air from the building was channeled to the SCC to destroy contaminants released during waste handling.

- In the building, two operators, in Level A personal protective equipment, opened the overpacks and the drums. The overpacks were triple-rinsed in accordance with 40 CFR § 261.7, they were later used for the storage of salt generated by the incineration system. The overpack rinsate was treated by carbon adsorption before discharge to the scrubber water evaporation unit. The operators used a suction lance to remove liquid organics from the drums which were then pumped to a storage tank. Once the liquids were removed, the drums were placed on an elevator, which took them to the top of a two-stage shredder.

- As the drums entered the shredder, pulverized corncobs were added. The corncobs served as a drying agent, which absorbed any liquids liberated from the drums during shredding. The first stage of the shredder broke the drums into large pieces. The pieces then dropped to the second stage of the shredder and were further broken into 1-inch pieces. A collection pan below the shredder was designed to capture liquids which leaked from the process.

- The shredded material was transported by an enclosed drag chain conveyor to a weight hopper. The conveyor was covered with a nitrogen blanket to purge oxygen from the area. The conveyor assembly was also perforated to allow for the drainage of excess liquids. From the weight hopper, the material was transported to the incinerator by a screw auger conveyer. The liquid organics in the storage tank were fed to the incinerator through a liquids nozzle.

- The incineration facilities were placed on a 90-by 160-foot temporary foundation that was sloped to the center to collect releases of wastes and stormwater. The kiln was 38 feet in length, had an outer diameter of 7 feet, and was lined with high-temperature refractory brick. The optimal throughput of contaminated feed was approximately 5,000 pounds per hour with a corresponding waste residence time of 1 hour.

- The kiln was rated at 50,000 BTU/hr, and was fueled by natural gas. The average kiln operating temperature was 2,000°F, and it rotated at a rate of 30 revolutions per hour. The waste residence time was approximately 40 minutes.

- Residual ash from the kiln was collected in an ash bin and later stored in drums. Off-gas from the incinerator was routed to two parallel 8-foot-diameter cyclone separators to partially remove particulates. Removed particulates were recycled to the waste feed and re-incinerated.

- Gases from the cyclone separator were routed to the SCC for further combustion of volatilized contaminants. The operating temperature of the SCC was approximately 2,200°F. The SCC had a length of 38 feet, a diameter of 7 feet, and was lined with high temperature refractory brick. The SCC was fueled by natural gas.

TREATMENT SYSTEM DESCRIPTION (CONT.)

System Description and Operation (Cont.)

- The exhaust gas from the SCC was then channeled to the system's spray drier to be cooled. After passing through the spray drier, the exhaust gas was drawn through a baghouse assembly; the baghouse assembly contained four individual baghouses in a two-by-two parallel configuration. The system allowed two baghouses in series to be in operation while the parallel system was cleaned. Following the baghouses, a venturi scrubber and a fiberglass reinforced vinylester baffle absorption scrubber removed additional particulates and acid gases from the gas. The spray drier, baghouse assembly, venturi scrubber, and absorption scrubber were designed to achieve a 95% particulate removal efficiency and a 99% acid gas removal efficiency for hydrogen chloride prior to atmospheric discharge [5].

- The quench and venturi scrubber sections required a water flow rate of approximately 300 gallons per minute (gpm) and the absorption scrubber required 600 gpm. The scrubbing system was fed with re-circulated water which was previously fed through a pH controller. The pH controller analyzed the pH of the water in order to control the feed rate of the sodium hydroxide used to neutralize the acid gases.

- The wastewater blowdown from the system contained sodium chloride salts and ash residue. The blowdown stream was controlled automatically by a liquid level control in the recirculation tank, which maintained the stream at approximately 40 gpm. Make-up water was provided to the system at a rate of 120 gpm to replace water lost through quenching and evaporation.

- The wastewater blowdown was discharged to a carbon adsorption system to remove organics. The discharge from the carbon system was passed to an evaporation system where the water was evaporated, leaving sodium chloride salts. The salts were collected in drums. The water used in the air pollution control system (APCS) was recycled within a closed system.

- Combustion gases were drawn through the incinerator and APCS by an induced draft fan and were exhausted through a 40-foot fiberglass reinforced vinylester stack.

- Incinerator residual and ash were disposed of off site in a Subtitle C hazardous waste disposal facility. A Subtitle C facility was required because the wastes fed to the incinerator were listed hazardous wastes, and therefore all residuals from the incineration process were also classified as hazardous wastes.

Table 3. Summary of Operating Parameters

Parameter	Value
Residence Time	40 minutes
System Throughput	NA
Kiln Temperature	2,000°F

TREATMENT SYSTEM PERFORMANCE

Cleanup Goals/Standards

- All of the material on site was considered acutely hazardous waste and was treated as listed hazardous waste under the "derived from" provision of the dioxin listing rule of January 14, 1985, 50 Federal Register, pp. 1978-2006 [3].
- Although the contents of all of the drums were incinerated on or off site, an action limit was established which corresponded to a 4.2 × 10^{-6} excess lifetime cancer risk over a 3 - year exposure, and a 9.9 × 10^{-5} excess lifetime cancer risk over a 70-year lifetime exposure.
- A DRE of 99.9999% was required for the POHCs in each dioxin listed waste that was fed to the incinerator.
- The delisting criteria for incinerator ash was set at 0.004 parts per trillion for dioxins.

Treatment Performance and Compliance

- The two trial burns conducted at Vertac were designed to operate the incineration system at conditions that would reflect worst case destruction and removal of all constituents of concern. Hexachlorobenzene was selected as the POHC for both trial burns. The reported DRE for hexachorobenzene is included in Table 4.
- The incinerator at Vertac operated within the operating limits established during the trial burn, signifying that all cleanup requirements established were met.

The AWFCOs and each parameter's respective percentage of the total number of cutoffs during the operation of the incinerator are shown in Table 5. Values for operating parameters during the trial burn are shown in Table 6. Information on the values of these parameters during post-trial burn operation was not available.

Table 4. Average Destruction and Removal Efficiency from the Second Trial Burn [6]

Contaminant	Average Contaminant Feed Rate (lb/hr)	Average Contaminant Rate Stack Gas Emissions (lb/hr)	Average Contaminant Rate in Residual (mg/kg)	DRE (%)
Hexachlorobenzene	60.0	9.01 x 10^{-5}	NA	99.999956

TREATMENT SYSTEM PERFORMANCE (CONT.)

Table 5. Automatic Waste Feed Cutoffs [7,11]

Parameter	Cutoff Limit	Frequency (%)
Minimum stack gas O_2 concentration	8.7%	75
Maximum stack gas CO concentration (@ 7% oxygen)	50 ppm	4
Minimum kiln exit temperature	1,604°F	3
Minimum SCC exit temperature	2,204°F	8
Minimum kiln draft	0.015 inches w.c.	7
Minimum SCC draft	0.015 inches w.c.	<1
Minimum scrubber liquid pH	2.6	1
Maximum stack gas flow rate	29,750 acfm	<1
Minimum Venturi scrubber pressure differential	21.0 inches w.c.	<1
Minimum brine flow to spray dryer	no flow	<1

w.c. = water column

Table 6. Operating Parameters [6]

Parameter	Trial Burn Value[1]
Hexachlorobenzene feed rate	60.0 lb/hr
Fuel-fired feed rate	NA
Emission Rate	
Particulate	NA
HCl	NA
Operating Conditions	
CO concentration in stack gas (@ 7% oxygen)	7.7% dry volume
Kiln exit gas temperature	NA
SCC exit temperature	NA
Stack gas flow rate	NA
O_2 concentration in stack gas	10.4% dry volume

[1]Values are from the second trial burn.

Performance Data Completeness

- Data are available for concentrations of contaminants in the drummed still-bottom waste before treatment.

Performance Data Quality

- The QA/QC program used throughout the remedial action met with EPA and ADPC&E requirements. All monitoring was performed using EPA-approved methods, and the vendor did not note any exceptions to the QA/QC protocols.

TREATMENT SYSTEM COST

Procurement Process

- ADPC&E contracted with MRK Industries to acquire and operate the incinerator at the site. When EPA took responsibility for the site in 1993, they contracted with URS Consultants, Inc. (now URS Greiner) to provide oversight at the Vertac site.
- ADPC&E initially managed the Vertac site using the $10.7 million which was provided by the established trust fund and letter of credit. When this money was exhausted, EPA took over management of the site [3].

Cost Data

- The actual cost of on-site incineration of $31,700,000 was reported in terms of capital costs and operation and maintenance costs. The actual capital costs for the incineration system were approximately $21,000,000 and actual operation and maintenance costs totaled approximately $10,700,000 for 32 months of operation. A total of 9,804 tons of still-bottom waste and soil were incinerated. This corresponds to a total unit cost for incineration of $3,200 per ton.

Cost Data Quality

- Actual capital and operations and maintenance cost data are available from the treatment vendor and EPA for this application.

OBSERVATIONS AND LESSONS LEARNED

Cost Observations and Lessons Learned

- The high cost per ton of waste incinerated was attributed to waste feed limitations due to the nature of the waste, specifically, high chlorine content and low pH [8].
- The contract cost of incinerating the 2,4,5-T waste off-site was $2/lb of dioxin waste. The total cost amounted to approximately $4,000,000 for 1,200 tons of 2,4,5-T waste [11].

Other Observations and Lessons Learned

- The variable nature of the waste feed slowed the incineration project. The inconsistency of the waste and the difference in heat content between the solid and liquid phases of waste, necessitated constant adjustment of the feed rate.
- Electrical surges caused unexplained shutdowns of the incinerator. Surge suppressors were installed to the input/output racks of the incinerator control system. Following installation, the number of shutdowns were reduced [12].
- Originally, calcium hydroxide solution was used as the neutralizing agent in the APCS. However, the subsequent calcium chloride residual in the brine solution which was recirculated through the APCS, clogged the spray drier. Therefore the neutralizing agent was changed to sodium hydroxide, which did not cause clogging problems.
- A video camera was installed in the shredder to allow operators to detect potential problems before the shredder jammed [5].
- A second CEM system was installed to allow daily calibration of the CEMs to occur without an incinerator shutdown. The second system allowed incineration to continue uninterrupted during calibration [5].

OBSERVATIONS AND LESSONS LEARNED (CONT.)

Public Involvement

- The public expressed a great deal of concern pertaining to the Vertac site. Two temporary restraining orders were filed to stop the incineration project. The anti-incineration campaign was led by Greenpeace and the Government Accountability Project. These groups felt that the citizens of Jacksonville would be put at risk from the emissions of the incinerator. The first restraining order was dissolved after court testimony substantiating the low-risk involved with operating the incinerator. The second restraining order temporarily prevented the incineration of the 2,4,5-T waste, which was later incinerated off site [9].
- Pro-incineration groups expressed concern over the amount of time it was taking to start the project. These groups wanted the EPA to start and finish the project as quickly as possible [9].

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