On-Site Incineration at the
Old Midland Products Superfund Site
Ola, Arkansas

Incineration at the Old Midland Products Superfund Site
Ola, Arkansas

<table>
<tr>
<td>Site Name:
Old Midland Products
Superfund Site</td>
<td rowspan="2">Contaminants:
Pentachlorophenol and polynuclear aromatic hydrocarbons, and VOCs
• Benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, fluoranthene, 2-methyl naphthalene, phenanthrene, benzene, toluene, trichloroethylene, xylene, and chloroform.
• PCP concentrations up to 5,900 mg/kg and PAH concentrations up to 38,000 mg/kg</td>
<td>Period of Operation:
June 1992 - May 1993</td>
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<tr>
<td>Location:
Ola, Arkansas</td>
<td>Cleanup Type:
Remedial action</td>
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<tr>
<td>Vendor:
Chemical Waste Management, Inc.
ENRAC South Division
P.O. Box 579
Ola, AR 72853-0579</td>
<td rowspan="2">Technology:
On-Site Incineration
• Solids pretreated with shredding, screening, and mixing with cement kiln dust
• Incineration system consisting of rotary kiln and secondary combustion chamber (SCC)
• Enclosed conveyor transported contaminated soil and debris to the unit
• Kiln temperature of 1,425°F, SCC temperature of 2,091°F
• Treated soil and debris (incinerator ash) discharged onto conveyors and taken to an ash storage area</td>
<td>Cleanup Authority:
CERCLA and State: Arkansas
• ROD Date: 3/24/88
• State-lead</td>
</tr>
<tr>
<td>SIC Code:
2491 (Wood Preserving)</td>
<td>Points of Contact:
Carlos Sanchez
U.S. EPA Region 6
1445 Ross Avenue
Suite 1200
Dallas, TX 75202
(214) 665-8507

Clark McWilliams
State of Arkansas
Department of Pollution Control and Ecology
P.O. Box 8913
Little Rock, AR 72219
(501) 682-0850</td>
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Incineration at the Old Midland Products Superfund Site
Ola, Arkansas

(Continued)

Waste Source:
Disposal lagoons - wood preserving waste

Purpose/Significance of Application:
Initially, dioxins and furans were believed to be present in the soil. Later, concentrations of dioxins and furans were determined to be very low and none were in the form of 2,3,7,8-TCDD.

Type/Quantity of Media Treated:
Sludge and Soil
- 102,000 tons of sludge and soil
- Moisture content: sludge - 43.6%

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 in 40 CFR part 264, subpart O

Results:
- Monitoring and trial burn data indicate that all DRE and emission standards have been met
- Analytical data of residuals indicate that cleanup goals have been met

Description:
Between 1969 and 1979, the site operated as a wood preserving plant. Effluents from the treatment process containing PCP and PAHs were discharged to seven on-site lagoons. A series of inspections at the site were performed by the Arkansas Department of Pollution Control and Ecology and the U.S. EPA between 1981 and 1986. A Record of Decision (ROD) was signed March 1988, specified on-site incineration as the remedial technology for the sludge, soil, and sediments. Site cleanup goals and DRE standards were specified for constituents of concern.

On-site incineration began in June 1992 and was completed in May 1993. The treatment system consisted of a rotary kiln and an SCC. An enclosed conveyor moved the soil and debris to the kiln for treatment. Treated ash from the incinerator was discharged to a conveyor and conveyed to a collection area. During its period of operation, the incinerator processed 102,000 tons of sludge and soil. Incineration achieved the soil cleanup goals specified in the ROD.

The total cost of the remedial action was approximately $27,000,000.

EXECUTIVE SUMMARY

This report presents cost and performance data for the application of on-site incineration at the Old Midland Products Superfund site in Ola, Arkansas. A rotary kiln incinerator was operated from June 1992 through May 1993 as part of a remedial action. Contaminants of concern at the site included pentachlorophenol (PCP) and polynuclear aromatic hydrocarbons (PAHs).

The Old Midland Products site was a former creosote and pentachlorophenol wood preserving plant and sawmill that operated from 1969 to 1979. During this time, effluent from wood preserving processes was discharged to on-site lagoons. Soil and sediment in the area of the lagoons were found to be contaminated with PCP and PAHs in concentrations as high as 5,900 mg/kg and 38,000 mg/kg, respectively.

In March 1988, a Record of Decision (ROD) was signed for the site, specifying incineration of surface soils, lagoon sludge, and sediments. The remedial action was conducted by the state of Arkansas, but was financed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The material specified for excavation and incineration included approximately 2,770 cubic yards of sludges, 850 cubic yards of sediment, and up to 21,000 cubic yards of soil. The ROD specified incinerator requirements that included a destruction and removal efficiencies (DRE) of 99.99% or 99.9999%, depending on the constituent. The ROD also specified that approximately 450,000 gallons of contaminated groundwater were to be pumped and treated on site. The remainder of this report will address only the incineration as required by the ROD, unless otherwise stated.

The selected incineration system consisted of a feed system; a rotary kiln; a secondary combustion chamber (SCC); and an air pollution control system (APCS). Excavated material was taken to a feed preparation building where it was screened and mixed with cement kiln dust prior to being fed to the kiln.

The resulting ash was discharged from the kiln and conveyed to an ash storage area while exhaust gases were channeled to the SCC. The SCC provided for further combustion of organics in the off-gases, which were then quenched with water.

The APCS consisted of a baghouse, a venturi quencher, and a scrubber. Particulate removal occurred in the baghouse. The venturi quencher cooled the gas, then the scrubber removed acid gases.

During the 9 months of operation, the incinerator processed approximately 102,000 tons of soil, sludge, and sediment. Treatment performance and air monitoring data collected during this application indicated that all performance standards and monitoring requirements were met.

The total cost for remediation using the incineration system was approximately $27,000,000.

SITE INFORMATION

Identifying Information

Old Midland Products Superfund Site
Ola, Arkansas

CERCLIS # ARD980745665

ROD Date: March 24, 1988

Treatment Application

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

Period of operation: June 1992 - May 1993

Quantity of material treated during application: 102,000 tons of creosote-contaminated sludges, soils, and drainageway sediments.

Background

Historical Activity that Generated Contamination at the Site: Creosote and pentachlorophenol wood preserving plant and sawmill

Corresponding SIC Code: 2491 (Wood Preserving)

Waste Management Practice That Contributed to Contamination: Storage and disposal of wastes in lagoons.

Site History:

- The Old Midland Products site is flat with a total area of approximately 37 acres. It is located in an agricultural area. A wildlife management area is located one mile north of the site.
- Between 1969 and 1979, the site operated as a wood preserving plant. Effluents from the wood treatment process containing PCP and PAHs were discharged to seven on-site lagoons.
- A series of inspections and investigations at the site were performed by the Arkansas Department of Pollution Control and Ecology (ADPC&E) and the U.S. EPA between 1981 and 1986.
- The remedial investigation and feasibility study (RI/FS) were completed in October 1987. An estimated 9,000 to 21,000 cubic yards of contaminated soil, 850 cubic yards of contaminated drainageway sediments, and 2,770 cubic yards of lagoon sludges were identified (a total of approximately 45,000 tons).
- The principal pollutants of concern were PCP and PAHs. During the RI, chlorinated dibenzodioxins and dibenzofurans were believed to be present, but later studies found only very low concentrations of these pollutants; no 2,3,7,8-TCDD was found.
- A trial burn was conducted in April 1992. Incineration began in June 1992 and was completed in May 1993. In that time, 102,000 tons of soil, sediment, and sludge were incinerated.

Regulatory Context:

- In June 1986, the Old Midland Products site was placed on the National Priorities List (NPL).
- The ROD was signed March 24, 1988, specifying source control by incineration of surface soils, lagoon sludge, and drainageway sediments.
- The Old Midland Products site was a state-lead site that was financed under CERCLA.

SITE INFORMATION (CONT.)

Background (Cont.)

- The selected remedy was conducted under the provisions of CERCLA, the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Contingency Plan (NCP) 40 CFR Part 300.
- The DREs were set in accordance with RCRA incinerator regulations in 40 CFR part 264, subpart O, §264.343.

Remedy Selection: On-site incineration was selected as the remedy for contaminated soil at the Old Midland Products Superfund site. This remedial action was deemed to be protective and cost-effective, and attained applicable or relevant and appropriate federal and state standards. It utilized permanent solutions and treatment technologies that reduced contaminant mobility, toxicity, and volume to the maximum extent practicable.

Timeline

Table 1. Timeline

Date	Activity
1969 - 1979	Dates of site operations
1981	Initial site investigation
June 1986	Site placed on the NPL
October 1987	Remedial Investigation/Feasibility Study completed
March 1988	Record of Decision signed
1991 - 1992	Contaminated soil is excavated
April 1992	Trial burn conducted
June 1992 - May 1993	Rotary kiln incinerator operational
October - November 1993	Site cleanup including seeding

Site Logistics/Contacts

Site Management: State-lead

Oversight: State

Remedial Project Manager:
Carlos Sanchez
U.S. EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202
(214) 665-8507

State Contact:
Clark McWilliams
State of Arkansas Department of Pollution Control and Ecology
P.O. Box 8913
Little Rock, AR 72219
(501) 682-0850

Treatment System Vendor:
Chemical Waste Management, Inc.
OHM Remediation
John Patin
225 West Airtex Boulevard
Houston, TX 77090
(281) 775-7071

MATRIX DESCRIPTION

Matrix Identification

Type of Matrix Processed Through the Treatment System: Surface soils, lagoon sludges, and drainageway sediments

Contaminant Characterization

Primary Contaminant Groups: Pentachlorophenol, polynuclear aromatic hydrocarbons, and VOCs

- Specific contaminants of concern included benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, fluoranthene, 2-methyl naphthalene, phenanthrene, benzene, toluene, trichloroethylene, xylene, and chloroform.
- The maximum detected concentrations of PCP was 790 mg/kg in the surface soil and 5,900 mg/kg in the lagoon sediments. The maximum detected concentrations of PAHs were 14,000 mg/kg in the surface soil and 38,000 mg/kg in the lagoon sediments.

Matrix Characteristics Affecting Treatment Costs or Performance

The major matrix characteristics that most significantly affected cost or performance at the site and their measured values are presented in Table 2.

Table 2. Matrix Characteristics of Lagoon Sludge

Parameter	Value	Measurement Procedure
Soil Classification	Silty clay	NA
Moisture Content	43.6%	NA
Chloride	1.13%	NA
Organics	13.39%	NA
Heat Content	6,165 Btu/lb	NA

TREATMENT SYSTEM DESCRIPTION

Primary Treatment Technology

Incineration system including:
- Rotary kiln; and
- Secondary combustion chamber (SCC).

Supplemental Treatment Technology

Pretreatment (solids): Screened and mixed with cement kiln dust

Post-Treatment (air):
- Quench tower
- Baghouse
- Venturi quencher
- Scrubber

Post-Treatment (scrubber water): Off-Site deep well injection

TREATMENT SYSTEM DESCRIPTION (CONT.)

System Description and Operation

- Excavated material was stockpiled and during the wet winter months, mixed with cement kiln dust to control its moisture content. The stockpiles were then moved into a feed preparation building where they were screened before being fed to the incinerator. An enclosed belt conveyor system fed bulk solids to the kiln feed hopper located above the screw feed system. From the kiln hopper, waste was conveyed into the kiln with a dual-rotor screw feeder.

- The kiln was constructed of 0.5-inch-thick steel plate and was lined with 5.5-inch-thick, high-fired, super-duty firebrick backed with a 0.5-inch-thick insulating board. The kiln had an inside diameter of 6.5 feet and a length of 45 feet.

- The oxygen-fuel burner was designed to burn natural gas or propane. The burner was rated at 30 million BTU per hour.

- The incineration system had a series of conveyors designed to combine incinerator ash collected at various points in the incinerator into a single ash stream for conveyance to the ash storage area. All conveyors used in the incineration system were totally enclosed and vented to the incinerator SCC or APCS to control fugitive emissions. Ash that was generated was sampled and analyzed to determine whether it met disposal requirements.

- Hot flue gases from the kiln were discharged through a hot gas cyclone into the SCC. The hot gas cyclone was a refractory-lined vessel that removed a portion of the particulate carry-over from the flue gases before their introduction into the SCC. The SCC was a vertical cylindrical chamber lined with six inches of high-temperature refractory with a burner located at the base of the unit. The SCC was operated at a minimum temperature of 2,050°F.

- The SCC gases entered the quench tower where the temperature was reduced to approximately 400°F with air-atomized water spray nozzles. The quenched combustion gases passed into two parallel baghouse assemblies. Each baghouse was designed with a four-to-one air-to-cloth ratio.

- From there, the internal draft fan drew combustion gases through the wet scrubbing system out to the stack. The fan was of centrifugal design, sized to develop a vacuum of approximately 25 inches water column (wc). The fan was powered by a 350-horsepower variable-speed motor. The fan maintained a negative pressure in the kiln.

- The wet scrubbing system consisted of a venturi quencher, a pre-packing spray, a packed bed absorber, and a Chevron mist eliminator.

- The venturi quencher used water sprays that cooled the off-gases from approximately 350°F to 185°F. A mildly caustic scrubber-water solution neutralized dissolved acid gases in the system. From the venturi quencher, the cooled flue gases entered the packed bed absorber section of the scrubber where they came in contact with the scrubber solution. The packed bed was designed to provide sufficient contact between the off-gases and the scrubber solution to permit efficient absorption and removal of the acid gas contaminants. Before the gas exited the stack, it passed through a Chevron mist eliminator for removal of entrained water droplets.

TREATMENT SYSTEM DESCRIPTION (CONT.)

System Description and Operation (Cont.)

- The stack was made of fiberglass-reinforced plastic and was approximately 73 feet high with a design flue gas exit velocity of 20 to 35 feet per second.
- Water used for ash quenching system was recirculated. Scrubber blowdown water was taken off site and disposed of by deep well injection.

Table 3. Summary of Operating Parameters

Parameter	Value
Solid Residence Time	NA
System Throughput	18 tons/hr
Kiln Exit Gas Temperature	1,200°F to 1,800°F

TREATMENT SYSTEM PERFORMANCE

Cleanup Goals/Standards

The cleanup goals and standards were specified by the ROD. The DRE was set based on RCRA standards.

- Soils, sludges, and sediments with concentrations of greater than 1 mg/kg of PCP were excavated and incinerated.
- The incinerator operating conditions set by the State specified that the incinerator must achieve a DRE of 99.99% for each organic hazardous constituent with the exception of PCP, polychlorodibenzo-p-dioxins (PCDD), and polychlorodibenzofurans (PCDF) which were required to achieve a DRE of 99.9999%. Once excavation began, the concentrations of dioxins and furans were determined to be very low; no 2,3,7,8-TCDD was found. However, the RP decided to meet the DRE of 99.9999% for these contaminants although it was not necessary.
- Ash was placed on site and covered with a vegetated soil layer. The ash disposal criteria were 1 ppm for PCP, 10 ppm for total PAHs, and 1 ppb for total dioxin and furans as TCDD.
- The maximum allowable concentration for total dioxins and furans was eventually raised from 0.1 ppb to 1.0 ppb TCDD equivalents after review and consideration of the thermal treatability study, the capabilities of the incinerator, and the long term risks to human health and the environment [6].
- The cleanup levels were deemed to be sufficient to clean the site to a 1×10^{-6} excess lifetime cancer risk level.

TREATMENT SYSTEM PERFORMANCE (CONT.)

Treatment Performance and Compliance

- A trial burn conducted at the Old Midland site was designed to operate the incineration system at conditions that would reflect worst-case destruction and removal of all constituents of concern.
- Naphthalene and 1,2,4-trichlorobenzene were selected as the POHCs to demonstrate the DREs for PAHs and PCP, respectively. The DREs for dioxins and furans also were demonstrated with 1,2,4-trichlorobenzene.
- The incinerator at Old Midland operated within the operating limits established during the trial burn, indicating that all requirements established in the ROD were met. The AWFCOs and their frequency of occurrence during the operation of the incinerator are shown in Table 5. Values for operating parameters during the trial burn are shown in Table 6; actual values for these parameters during operation were not available.
- Ash generated from the incinerator was sampled and analyzed to determine if it was in compliance with disposal requirements. The complete list of maximum allowable concentrations for hazardous constituents in the ash is presented in Table 7.

Table 4. Average Destruction and Removal Efficiencies from Compliance Testing

Contaminant	Average Contaminant Feed Rate in Soil (lbs/hr)	Average Contaminant Rate in Stack Gas Emissions (lbs/hr)	Average Contaminant Rate in Residual (g/hr)	DRE (%)
1,2,4-trichlorobenzene	57.6	0.000078	NA	99.99987
naphthalene	50.9	0.00016	NA	99.9997

Table 5. Automatic Waste Feed Cutoffs

Parameter	Cutoff Limit	Frequency
Maximum waste feed rate, 1 hour rolling average	18.1 TPH	19
Maximum kiln pressure, instantaneous	-0.1 inch w.c.	20
Minimum kiln temperature, 1 hour rolling average Instantaneous	1396°F 1200°F	6
Minimum rotary valve purge flow, instantaneous	50 cfm	33
Minimum rotary valve purge pressure, instantaneous	0.5 inch w.c.	1
Minimum SCC temperature, instantaneous	2,088°F	82
Minimum SCC oxygen concentration, dry gas volume percent	3%	176
Minimum baghouse differential pressure, instantaneous	1 inch w.c.	10
Minimum scrubber waste water flow rate, instantaneous	451 gpm	10
Minimum scrubber pH, if below for 60 minutes or more	6.5	0
Maximum stack gas CO concentration, uncorrected 1 hour rolling average (dry gas)	100 ppmv	2
Maximum stack gas THC concentration, uncorrected 1 hour rolling average (dry gas)	20 ppmv	6
Maximum stack gas velocity, instantaneous	20.7 ft/sec	65

TREATMENT SYSTEM PERFORMANCE (CONT.)

Table 6. Operating Parameters

Parameter	Trial Burn Value
Waste feed rate	18 tph
Kiln pressure	-0.1 inches w.c.
Kiln temperature	1,425°F
Rotary valve purge flow	37.9 cfm
SCC temperature	2,091°F
SCC oxygen concentration	3%
Baghouse differential pressure	1 inch w.c.
Scrubber waste flow rate	451 gpm
Scrubber pH	6.5
Stack gas CO concentration	100 ppm
Stack gas THC concentration	20 ppm
Stack gas velocity	20.2 ft/sec
Chlorine feed rate	171 lb/hr
Ash feed rate	29,900 lb/hr
Dissolved solids in the scrubber water	1.08 g/mL
Differential pressure across scrubber packing	1 inch w.c.
Quench exit temperature	426°F

Table 7. Maximum Allowable Concentrations for Hazardous Constituents in the Ash

Constituent	Maximum Allowable Concentration*
Pentachlorophenol, PCP	1.0
Dioxins and Furans as TCDD	1.0 ppb
Naphthalene	1.0
Phenanthrene	0.3
Acenaphthene	0.3
Acenaphthylene	0.3
Fluorene	0.3
Chrysene	0.3
Pyrene	0.3
Benzene	0.1
Ethylbenzene	0.1
Toluene	0.1
Xylene (total)	0.1
Total BNA	10.0
Total PNA	10.0

* Reported in ppm in less otherwise stated.

TREATMENT SYSTEM PERFORMANCE (CONT.)

Performance Data Completeness

- Data are available for concentrations of contaminants in the soil and sediment before treatment.
- Data are also available for concentrations of contaminants in the incinerator residue. These data were collected periodically throughout operation of the incinerator prior to landfilling.

Performance Data Quality

- The Quality Assurance/Quality Control program used throughout the remedial action was deemed to have met EPA and State of Arkansas requirements.

TREATMENT SYSTEM COST

Procurement Process

- Chemical Waste Management, Inc., ENRAC South Division was the remedial contractor for the incineration.

Cost Data

- The cost data were provided by the Arkansas Department of Pollution Control & Ecology. The estimated cost for operating the incinerator at the site was about $17,100,000. Additional contaminated soil was encountered during the remedial action. A total of 102,000 tons of soil, sludge, and sediment were incinerated. Total project cost was approximately $27,000,000. This corresponds to a total unit cost of $264 per ton. Table 8 shows information on costs for the remedial action at the site.

Table 8. Costs

WBS Number			Description	Cost
331	01	01	Mobilization of Construction Equipment and Facilities	$984,500
331	01	03	Submittals/implementation Plans	$1,031,304
331	01	04	Setup/Construct Temporary Facilities	$303,600
331	02	06	Sampling Soil and Sediment	$1,307,900
331	02	09	Laboratory Chemical Analysis	
331	03	02	Clearing and Grubbing	$210,490
331	03	03	Earthwork (i.e., excavating, backfill, grading, stockpiling)	$12,699,115
331	14	01	Incineration (including feed preparation)	
331	03	05	Fencing	$26,056
			Miscellaneous	$551,000
			Additional contaminated soil	$9,886,035
			Total	**$27,000,000**[1]

[1] This number is an approximation; as a result, the total of the number's in the table do not exactly match this number.

OBSERVATIONS AND LESSONS LEARNED

Cost Observations and Lessons Learned

- The cost was higher than initially estimated because the amount of material to be incinerated was underestimated. According to site personnel, the very demanding cleanup goals required additional excavation not originally planned based on the results of the RI/FS. In addition, the geology of the area was folded and faulted; as a result, analysis of soil borings did not yield representative results of subsurface contamination.

Other Observations and Lessons Learned

- Site personnel reported few problems during incineration. Reasons cited for success include thorough characterization of the waste before it was fed to the incinerator and the development of detailed plans at the beginning of the project.

Public Involvement

- According to site personnel, local politicians and residents did not raise significant opposition to the selected remedial action.
- A community involvement plan was developed in August 1985 and revised in December 1988. An open house was held May 1986, and periodically, fact sheets were sent to the 10 citizens on the site mailing list.

REFERENCES

1. Superfund Record of Decision, Old Midland, Ola, Arkansas, March 1988.
2. Old Midland Products Superfund Site Incinerator Facility Trial Burn Plan 2, Radian Corporation, March 1992.
3. Old Midland Products Superfund Site Incinerator Operating Conditions, State of Arkansas, June 1992.
4. EPA Region VI Superfund Homepage, Internet, (http://www.epa.gov/earth1r6/6sf/midland.pdf) March 26, 1997.
5. Personal communication with Carlos Sanchez, U.S. EPA Region VI, June 9, 1997.
6. Remedial Action Report Construction Phase Old Midland Products Site, IT Corporation, May 1996.
7. Contractor's Site Specific Worker Health and Safety Plan, Old Midland Products Site, Chemical Waste Management, May 1991.
8. Old Midland Products Superfund Site Incineration Facility Trial Burn Test Report, Radian Corporation, May 1992.
9. Incineration Facility Description Report, Chemical Waste Management, Inc., January 1992.
10. Remedial Investigation Draft, Old Midland, IT/MTR, July 1987.