On-Site Incineration at the Petro Processors Superfund Site Baton Rouge, Louisiana

Incineration at the Petro Processors Superfund Site
Baton Rouge, Louisiana

<table>
<tr><td>Site Name:
Petro Processors Superfund Site</td><td rowspan="2">Contaminants:
Chlorinated Hydrocarbons, Polynuclear Aromatic Hydrocarbons (PAHs), Heavy Metals, and Oils
• Hexachlorobutadiene and hexachlorobenzene</td><td>Period of Operation:
November 1994 to Present</td></tr>
<tr><td>Location:
Baton Rouge, Louisiana</td><td>Cleanup Type:
Remedial action</td></tr>
<tr><td>Site General Contractor:
NPC Services, Inc.
500 Brooklawn Drive
Baton Rouge, Louisiana 70816
(504) 778-6200</td><td rowspan="2">Technology:
On-Site Incineration
• Combustion of fumes and liquids from groundwater treatment system
• Incineration system consisting of a horizontal, direct-fired kiln
• Air fan delivers fumes and centrifugal pump delivers liquids to the unit
• Kiln temperature of 2,000°F to 2,400°F
• Blowdown from the system is pH adjusted with lime and discharged</td><td>Cleanup Authority:
CERCLA and State: Louisiana
• ROD Date: No ROD, Consent Decree took the place of the ROD
• RP-lead</td></tr>
<tr><td>SIC Code:
4953 (Refuse Systems)</td><td>Point of Contact:
Cynthia Kaleri
Remedial Project Manager
U.S. EPA Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733
(214) 665-6772</td></tr>
<tr><td>Waste Source:
Disposal of petrochemical wastes in on-site lagoons</td><td colspan="2" rowspan="2">Type/Quantity of Media Treated:
Liquids and Fumes
• 213,376 gallons of DNAPLs to date</td></tr>
<tr><td>Purpose/Significance of Application:
Incinerator treats liquid organics and air stripper fumes from a groundwater treatment system</td></tr>
<tr><td colspan="3">Regulatory Requirements/Cleanup Goals:
• Destruction and Removal Efficiency (DRE) of 99.99% for organic constituents of concern as required by Resource Conservation and Recovery Act (RCRA) incinerator regulations in 40 CFR part 264, subpart O</td></tr>
<tr><td colspan="3">Results:
• Emissions and trial burn data indicate that all DRE and emission standards have been met to date</td></tr>
<tr><td colspan="3">Cost Factors:
• Total cost of the incinerator is approximately $32,827,799 to date
• Approximate Total Capital Costs: $18,159,087 (including equipment, site preparation, construction/engineering, startup); Projected Future Capital Costs: $500,000
• Approximate Total Operating Costs: $14,668,912 (including maintenance, project management, sampling and analysis, supplies); Projected Future Monthly Operating Costs: $300,000 per month</td></tr>
</table>

Incineration at the Petro Processors Superfund Site
Baton Rouge, Louisiana

(Continued)

Description:
Between 1961 and 1980, the Petro Processors Superfund Site operated as a petrochemical waste disposal area. A remedial investigation determined that soil and groundwater at the site were contaminated. A Consent Decree entered into Federal Court on February 16, 1984 specified that a plan of action be developed for the site. The plan included a groundwater treatment system which utilized an incinerator to treat liquid organics and air stripper fumes. Site cleanup goals and DRE standards were specified for the organic constituents of concern.

The treatment system began operation in November 1994 and is ongoing at the time of this report. The incineration system consists of a horizontal, direct-fired incinerator. A centrifugal pump and an combustion air fan deliver the liquid and fume waste, respectively, to the incinerator. The incinerator is equipped with an air pollution control system consisting of a quench tank; an HCl absorber/caustic scrubber tower; a particulate scrubber; and a entrainment separator.

The total cost of the remedial action is approximately $32,827,799 to date. Capital costs accounted for approximately $18,159,087 with a projected future cost of $500,000. Operation and maintenance costs accounted for approximately $14,668,912 with a projected future monthly cost of $300,000.

EXECUTIVE SUMMARY

This report presents cost and performance data for the application of on-site incineration at the Petro Processors (Petro) Superfund site in Baton Rouge, Louisiana. Since November 1994, an incinerator designed to dispose of fumes and liquids from the groundwater treatment system has been operating as part of a remedial action. Contaminants of concern at the site include chlorinated hydrocarbons, polynuclear aromatic hydrocarbons (PAHs), heavy metals, and oils.

The Petro site operated as a petrochemical waste disposal site from 1961 to 1980. During this period, various chemical wastes were disposed of in lagoons. It was estimated based on the results of an investigation conducted at the site that 330,000 m^3 of soil was contaminated. Groundwater and soil at Petro is contaminated with hexachlorobutadiene and hexachlorobenzene.

In 1984, a Consent Decree was signed by Federal and State government agencies and the Responsible Parties (RPs) for the Petro site. A Destruction and Removal Efficiency (DRE) of at least 99.99% for organic constituents of concern was called for by the approved operating specifications.

Remedial activities at the site include the design, construction and operation of a groundwater treatment system which uses the incinerator for the destruction of the residuals generated. This report focuses on the cost and performance of the incinerator and does not present any detailed information on the groundwater treatment system.

Groundwater is currently being extracted with a system of 165 recovery wells. Recovered groundwater is treated by phase separators to remove non-aqueous phase liquids (NAPLs) from the water; the separated water is treated with air strippers to remove additional contaminants.

The NAPLs removed by the groundwater treatment system are stored in a waste feed tank prior to being fed to the incinerator through a liquid waste feed nozzle. The vent gas from the air strippers also is fed to the incinerator as part of the combustion air.

The incineration system consists of a vent gas feed system; a liquid waste feed system; a horizontal, direct-fired incinerator; a quench tank; a HCl absorber/caustic scrubber; a particulate scrubber; and an entrainment separator.

The incinerator volatilizes and destroys organic compounds from the liquid and fumes. Treated gas is then drawn into the quench tower for cooling. The HCl absorber/caustic scrubber then removes HCl, Cl_2, SO_2, and some particulate matter. The particulate scrubber and entrainment separator remove additional particulate matter before off-gas is released through the stack.

During the 30 months of operation, the incinerator has processed approximately 213,376 gallons of dense non-aqueous phase liquids (DNAPLs). Treatment performance and emissions data collected during this application indicate that all performance standards and monitoring requirements are being achieved.

The cost for treatment of the residuals using the incineration system is approximately $32,827,799 to date. This amount consists of $18,159,087 in capital costs and $14,668,900 in operating costs.

SITE INFORMATION

Identifying Information

Petro Processors Superfund Site
Baton Rouge, Louisiana

CERCLIS #: LAD057482713

ROD Date: Not Applicable. A Consent Decree was issued in lieu of a ROD.

Background

Historical Activity that Generated Contamination at the Site: Waste collection and disposal

Corresponding SIC Code: 4953 (Refuse Systems)

Waste Management Practice That Contributed to Contamination: Disposal of waste in on-site lagoons.

Site History:

- The Petro site operated from 1961 until its closure in 1980. The site is comprised of two former petrochemical waste disposal areas, the Scenic Highway and Brooklawn areas, which are located approximately 1.5 miles apart.
- The Scenic Highway area operated from 1961 until 1974 and covers approximately 17 acres. The area was filled and closed in 1974, but there was still concern over the potential for leachate migration and erosion.
- The Brooklawn site operated from 1969 until 1980 and covers approximately 60 acres. No known actions were taken to mitigate potential risks to human health and the environment at the time operations ceased.
- During the site's period of operation, various petrochemical wastes were disposed of in unlined lagoons. It was estimated based on investigation at the site that 330,000 m^3 of soil was contaminated.
- Soil and groundwater at Petro were contaminated with chlorinated hydrocarbons, PAHs, heavy metals, and oils.
- A spill from the waste lagoons in 1969 contaminated a local ranch, killing 30 cattle. Additionally, on several occasions, waste in the lagoons spontaneously ignited.
- The Petro site is located over a drinking water aquifer for the area referred to as the 400-foot sands.
- In July 1980, the U.S. Department of Justice, the State of Louisiana, the City of Baton Rouge, and the Parish of East Baton Rouge filed suit against the site owner and several waste generators who had transported material to the site for disposal [1].
- A Consent Decree was entered into the Federal Court's record on February 16, 1984. Under the terms of the decree the site was closed and the RPs were required to investigate and develop a detailed plan of action for the Petro Site [1].
- The proposed remedy included the excavation and incineration of visibly contaminated soil; the solidification, incineration, or off-site disposal of all non-aqueous phase wastes in the lagoons; and the installation of recovery wells to recover NAPLs [1].

Treatment Application

Type of action: Remedial (groundwater treatment with on-site incineration of residuals)

Period of operation: 1994 - present

Quantity of material treated during application: 213,376 gallons of LNAPLs to date

SITE INFORMATION (CONT.)

Background (Cont.)

- In 1987, during the early phases of the excavation at Brooklawn, on-site air monitoring equipment detected volatile organic compounds. Operations at the site ceased in order to protect the safety of on-site workers and the safety of workers at industrial plants adjacent to the site.

- In December 1988, the RPs reported in a Supplemental Remedial Action Plan (SRAP) that the remediation could not continue under the proposed plan without future unacceptable releases of volatile organic compounds. As required by the Consent Decree, the RPs also proposed methods for remediation in the SRAP. EPA Region VI, however, found the RPs' findings insufficient and began an internal 18-month review of potential remedial solutions.

- In 1989, the SRAP was approved amending the Consent Decree and the remedy changed to capping the lagoons and hydraulic containment of the groundwater plume. Based on the findings of the amended Consent Decree, the RPs began design and construction activities.

- The majority of the Brooklawn area was covered by a soil cap, seeded, and contoured to control erosion. This action was completed July 1990, at which time the RPs also submitted a workplan for the earthwork which was needed at the Scenic Highway site. One lagoon in the area was and currently is left open in order to deposit drill cuttings from the wells installed on site. A groundwater treatment system was installed in 1994, which currently includes 98 sumps and 190 operating recovery wells of a planned number of 213.

- As in the Brooklawn area, the Scenic Highway area was covered with a soil cap, seeded, and contoured to control erosion. This action was completed September 1992. In October 1996, eleven recovery wells were installed to recover NAPLs from the area and thirty-four monitoring wells were installed to gauge the natural attenuation of the plume. The contingent remedy had not been implemented at the time this report was prepared.

- The treatment system that was constructed at the Brooklawn area included an incinerator which was capable of disposing of both organic liquids and fumes. A trial burn was conducted the week of November 7, 1994, after which the incinerator began operating under interim conditions. The final operating specifications were approved by EPA on December 28, 1995.

- Bayou Baton Rouge was re-routed during remedial activities so that it did no flow through the site. Portions of the site are located within the Bayou Baton Rouge flood plain.

- A section of the Brooklawn area is in the Mississippi River flood plain. Additionally, the Mississippi flood plain located to the south of the Brooklawn area, known as Devil's Swamp, is classified as a wetland. A state health advisory currently covers parts of Devil's Swamp.

Regulatory Context:

- In 1984, the Petro Site was placed on the National Priorities List (NPL).

SITE INFORMATION (CONT.)

Background (Cont.)

- In 1984, a Consent Decree was filed into Federal Court, which required remedial activities at the site in Baton Rouge, Louisiana.
- Treated groundwater is discharged under a National Pollutant Discharge Elimination System (NPDES) permit.
- The DREs were set in accordance with Resource Conservation and Recovery Act (RCRA) incinerator regulations in 40 CFR, part 264 subpart O.

Remedy Selection: Hydraulic containment and recovery followed by on-site incineration of free-product and nonaqueous organic residuals from the groundwater treatment system was selected as the remedy for the Petro Processors Superfund site. On-site incineration was selected based on the cost associated with using an incinerator and the reduction in long-term threats to human health and the environment which occurred as a result of destroying the contaminants.

Timeline

Table 1. Timeline

Date	Activity
1961 - 1980	The Petro Site was used for disposal of petrochemical waste
February 1984	Consent Decree established for site cleanup
1984	Petro Site was placed on the NPL
1987	Remedial construction begins
1989	Consent Decree amended
November 7 - 11, 1994	Trial Burn
November 1994 - December 1995	Incinerator operated under interim standards
December 28, 1995	Final operating standards approved for incinerator

Site Logistics/Contacts

Site Management: RP-lead

Oversight: EPA

Remedial Project Manager:
Cynthia Kaleri
U.S. EPA Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733
(214) 665-6772

State Contact:
Glenn Miller
Louisiana Department of Environmental Quality
Inactive and Abandoned Sites Division
P.O. Box 82282
Baton Rouge, Louisiana 70884-2282

Site General Contractor:
Bill Dawson
NPC Services, Inc.
3867 Plaza Tower Drive
Baton Rouge, Louisiana 70816
(504) 778-6206

MATRIX DESCRIPTION

Matrix Identification

Type of Matrix Processed Through the Treatment System: Organic liquid and gas residuals generated during the treatment of groundwater contaminated by infiltration from unlined waste lagoons used for waste disposal.

Contaminant Characterization

Primary Contaminant Groups: Chlorinated hydrocarbons, PAHs, heavy metals, and oils

- The contaminants of greatest concern were hexachlorobutadiene and hexachlorobenzene.

Matrix Characteristics Affecting Treatment Costs or Performance

Information on matrix characteristics was not available.

TREATMENT SYSTEM DESCRIPTION

Primary Treatment Technology

Incineration system including:

- Fume waste feed system
- Organic liquid waste feed system
- Horizontal, direct-fired incinerator

Supplemental Treatment Technology

Pretreatment (liquids):

- Agitation

Post-Treatment (air):

- Quench tank
- HCl absorber/caustic scrubber tower
- Particulate scrubber
- Entrainment separator

Post-Treatment (water):

- pH adjustment
- Carbon adsorption

System Description and Operation

- Groundwater is recovered from the Brooklawn site using an existing system of 165 extraction wells. The groundwater is pumped through phase separators to remove NAPLs and air strippers to remove dissolved organics. The treatment system is designed to treat groundwater with 1,000 to 2,000 mg/L of chlorinated organics.

- The NAPL liquid waste is stored in a waste feed tank, which contains an agitator to maintain a homogenous mixture, prior to being fed into the incinerator. The tank is a pressure vessel rated at 15 psig with a storage capacity of 4,760 gallons, which provides storage capacity of approximately one day. [2].

TREATMENT SYSTEM DESCRIPTION (CONT.)

System Description and Operation (Cont.)

- The tank is padded with nitrogen to maintain an inert, non-flammable mixture above the liquid and it is kept at an operating pressure between 2 and 10 psig. To maintain the correct pressure, the tank is vented as needed to the incinerator through a flame arrestor. The waste tank is equipped with an electric heating panel to control the viscosity of the waste at a temperature between 70°F and 95°F.

- The liquid waste is pumped by a centrifugal pump through a strainer to remove any solids and into the incinerator liquid waste feed nozzle. The liquid waste feed is monitored by a Coriolis meter and controlled by a flow control valve and a safety shutoff valve. If an automatic waste feed cutoff (AWFCO) is initiated, the pump is shut down, and the feed control valve and safety shutoff valve are closed. The liquid waste feed nozzle is atomized with air supplied by an on-site air compressor; the atomization air pressure is maintained above the liquid waste feed pressure at the nozzle [2].

- The vent gas stream produced by the air strippers is fed to the incinerator through a combustion air fan and is discharged into the incinerator as part of the total combustion air. The flow of the combustion air fan is controlled such that the minimum air flow to the incinerator exceeds the vent gas flow; this is designed to provide the incinerator with sufficient air for proper combustion. A gravity damper allows fresh air to be pulled into the blower with the vent gas stream if the burner demands more air than that supplied by the vent gas stream [2].

- The design maximum vent gas flow rate is 2,800 standard cubic feet per minute (scfm); the combustion air fan has a design capacity of 3,260 scfm. The combustion air flow is monitored by a flow meter and controlled by a flow control valve on the suction line [2].

- The incinerator is 30 feet in length, has an outer diameter of 8.5 feet, and is lined with 8 inches of firebrick and castable lining. The incinerator has a firing capacity of 14 million BTU/hr. A negative pressure is maintained within the incinerator in order to prevent fugitive emissions.

- The incinerator is designed to dispose of vent gases and liquids simultaneously, but can process either wastestream separately should an AWFCO occur.

- The incinerator operates in both a fume and liquid-injection mode. While operating in the fume mode natural gas is used as a fuel. The liquid-injection mode includes operation while using liquid organics recovered from the site to supplement or replace the natural gas [2].

- The incinerator is equipped with two burners. A low-NO_x main burner is used for firing liquids. The waste and atomization air are discharged from the nozzle through small orifices in the nozzle tip directly into the main burn flame [2].

TREATMENT SYSTEM DESCRIPTION (CONT.)

System Description and Operation (Cont.)

- Natural gas is used as auxiliary fuel for the incineration system and is fed to the incinerator through a burner located at the inlet end of the incinerator chamber, which is fired tangentially into the main burner flame [2]. The design liquid waste feed rate is 1,600 lb/hr and the design temperature for liquid-injection operation is 2,000°F to 2,400°F.
- The exhaust gas from the incinerator is channeled to the quench tower, where it is cooled with water to approximately 175°F. The quench tank is a vertical, wet-walled, rubber-lined steel vessel. An emergency water tank is installed above the quench tank in the event of a loss of process water. The RP estimate is estimated that 50% of the HCl in the exhaust gas is absorbed in the quench tank.
- Following the quench tank, the exhaust gas enters the HCl absorber/caustic scrubber tower. The tower is a vertical fiberglass vessel containing packed sections. Water recirculated through the HCl absorber removes approximately 40% of the HCl in the gas.
- The caustic scrubber is designed to remove approximately 99.9% of the remaining HCl, 97% of the Cl_2, 90% of the SO_2, and some particulate matter. A blowdown stream from the caustic scrubber is fed to the HCl absorber to remove salt and ash from the caustic scrubber system [2].
- Residuals collected in the blowdown from the APCS is treated by a carbon adsorption unit which is part of the groundwater treatment system.
- The off-gas leaves the scrubber system and enters a high-energy particulate scrubber, where it is split into two streams. The two streams are then recombined and are contacted with a recirculating water stream where water droplets entrap particulate matter. The particles are then removed from the water in the entrainment separator.
- Blowdown from the APCS is pumped into a neutralization system. The blowdown is treated with lime to bring the pH into the 6 - 9 range before discharge under the terms of a NPDES permit to the Mississippi River.
- Combustion gases were drawn through the incineration system by a variable speed, induced draft fan and were exhausted through an 100-foot stack. The fan has a 75 hp motor and is designed to handle 4,400 scfm. Design condition flue gas velocity is 3,800 - 4,000 actual cubic feet per minute (acfm) at a temperature of 147°F.
- The groundwater which was isolated from the NAPLs in the phase separator is treated with carbon adsorption before being discharged under a NPDES permit.

Table 2. Summary of Operating Parameters

Parameter	Value
Residence Time	2 seconds
System Throughput	980 lb/hr (liquid)
Kiln Temperature	1,600° (fume mode) 2,000°F - 2,300°F (liquid mode)

TREATMENT SYSTEM PERFORMANCE

Cleanup Goals/Standards

- The DRE requirements were set based on RCRA incinerator regulations 40 CFR part 264, subpart O.
- A DRE of 99.99% was required for each constituent of concern.
- A 60-minute rolling average stack gas CO concentration less than or equal to 100 parts per million by volume (ppmv), dry basis, corrected to 7% O_2 is required for the incinerator.
- Stack gas particulate concentrations of less than or equal to 0.04 grains per dry standard cubic foot (gr/dscf), dry basis, corrected to 7% O_2 are required for the incinerator.
- HCl emissions of less than or equal to 4 lb/hr are required for the incinerator.

Treatment Performance and Compliance

- Two trial burns, one for liquid mode incineration and one for fume mode incineration, were conducted at Petro. These trial burns were designed to operate the incineration system at conditions that would reflect worst-case destruction and removal of all constituents of concern.
- Tetrachloroethene and monochlorobenzene were selected as the principal organic hazardous constituents (POHCs) for the liquid mode trial burn; 1,1, 2 - trichloroethane and trichloroethene were selected as the POHCs for the fume mode trial burn. The reported DREs for each POHC are included in Table 3-A and 3-B.
- To date, the incinerator at Petro has operated within the operating limits established during the trial burn, signifying that all cleanup requirements that have been established are being met. The AWFCOs and their frequency of occurrence during the operation of the incinerator are shown in Table 4-A and 4-B. Trial burn and typical operating parameters are shown in Tables 5-A and 5-B.

Table 3-A. Average Destruction and Removal Efficiencies from Liquid Mode Trial Burn [3]

Contaminant	Average Organic Liquid Waste Feed Rate (lb/hr)	Average Contaminant Rate in Stack Gas Emissions (g/hr)	Average Contaminant Rate in Residual (µg/kg)	DRE (%)
Tetrachloroethene	1,472	NA	NA	99.99999
Monochlorobenzene	1,472	NA	NA	99.99999

Table 3-B. Average Destruction and Removal Efficiencies from Fume Mode Trial Burn [4]

Contaminant	Average Air Stripper Flow Rate (gpm)	Average Contaminant Rate in Stack Gas Emissions (g/hr)	Average Contaminant Rate in Residual (µg/kg)	DRE (%)
1,1,2-Trichloroethane	200	NA	NA	99.99998
Trichloroethene	200	NA	NA	99.99999

TREATMENT SYSTEM PERFORMANCE (CONT.)

Table 4-A. Automatic Waste Feed Cutoffs for Liquid Mode Incineration [3,6]

Parameter	Cutoff Limit	Frequency
Maximum organic liquid feed rate[1]	1,470 lb/hr	Monthly
Minimum combustion chamber gas temperature[2]	2,000°F	Monthly
Maximum combustion chamber gas temperature[2]	2,300°F	Monthly
Minimum caustic scrubber pH[1]	7.5	Monthly
Minimum HCl absorber recycle flow rate[1]	130 gpm	Monthly
Minimum caustic scrubber recycle flow rate[1]	300 gpm	Monthly
Maximum stack gas flow rate[1]	15,200 lb/hr	Monthly
Minimum particulate scrubber differential pressure[1]	35 inches w.c.	Monthly
Maximum combustion chamber pressure[2]	-0.1 inches H_2O	Monthly
Maximum stack gas CO concentration (corrected to 7% O_2)[1]	100 ppmv	Monthly
Minimum stack gas O_2 concentration[1]	2% volume dry basis	Monthly
Maximum quench chamber exit gas temperature[2]	200°F	Monthly

w.c. = Water column
[1]Based on 60-minute rolling average
[2]Instantaneous value

Table 4-B. Automatic Waste Feed Cutoffs for Fume Mode Incineration [4,6]

Parameter	Cutoff Limit	Frequency
Maximum air stripper water flow rate[1]	200 gpm	Monthly
Minimum combustion chamber gas temperature[2]	1,600°F	Monthly
Minimum caustic scrubber pH[1]	7.5	Monthly
Minimum HCl absorber recycle flow rate[1]	130 gpm	Monthly
Minimum caustic scrubber recycle flow rate[1]	300 gpm	Monthly
Maximum stack gas flow rate[1]	16,200 lb/hr	Monthly
Maximum combustion chamber pressure[2]	-0.1 inches H_2O	Monthly
Maximum stack gas CO concentration (corrected to 7% O_2)[1]	100 ppmv	Monthly
Minimum stack gas O_2 concentration[1]	2% volume dry basis	Monthly

[1]Based on 60-minute rolling average
[2]Instantaneous value

TREATMENT SYSTEM PERFORMANCE (CONT.)

Table 5-A. Operating Parameters for Liquid Mode Incineration [3,6]

Parameter	Actual Value	Trial Burn Value
Contaminated Organic Liquid Waste Feed Rate	980 lb/hr	1,472 lb/hr
Fuel-Fired Feed Rate	14 million BTU/hr	14 million BTU/hr
Emission Rate		
Particulate matter	NA	0.0264 gr/dscf
HCl	NA	0.190 lb/hr
Cl_2	NA	0.003 lb/hr
Hydrocarbons	NA	0.7 ppmv
Operating Conditions		
Maximum CO concentration in gas (corrected to 7% O_2)	1.6 ppmv	1.7 ppmv
Minimum combustion chamber gas temperature	2,042°F	2,000°F
Minimum caustic scrubber pH	8.2 s.u.	7.5 s.u.
Minimum HCl absorber recycle flow rate	178 gpm	131 gpm
Minimum caustic scrubber recycle flow rate	369 gpm	305 gpm
Minimum particulate scrubber differential pressure	37 inches w.c.	35 inches w.c.
Maximum combustion chamber pressure	-2.34 inches w.c.	-1.26 inches w.c.
Quench chamber exit gas temperature	169°F	178°F

w.c. = Water column

Table 5-B. Operating Parameters for Fume Mode Incineration [4,6]

Parameter	Actual Value	Trial Burn Value
Air Stripper Flow Rate	93 gpm	200 gpm
Fuel-Fired Feed Rate	14 million BTU/hr	14 million BTU/hr
Emission Rate		
Particulate matter	NA	0.0018 gr/dscf
HCl	NA	0.01 lb/hr
Cl_2	NA	0.07 lb/hr
Hydrocarbons	NA	Not Available
Operating Conditions		
Maximum CO concentration in gas (corrected to 7% O_2)	1.2 ppmv	3.8 ppmv
Minimum combustion chamber gas temperature	1,680°F	1,600°F
Maximum combustion chamber pressure	-2.443 inches w.c.	-450 inches w.c.
Quench chamber exit gas temperature	156°F	158°F

w.c. = Water column

Performance Data Completeness

- Data are available for concentrations of contaminants in the groundwater before treatment.
- Data are also available for concentration of contaminants in the liquid and gaseous waste that were fed to the incinerator the two trial burns.

Performance Data Quality

- The QA/QC program used throughout the remedial action met EPA and the State of Louisiana 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

- The RPs have installed and are operating the treatment system, including the incinerator, at the site.

Cost Data

- The estimated treatment cost of $59,221,500 and the projected costs were reported by the RPs in terms of capital costs and operation and maintenance costs. To date, the estimated capital costs for the incinerator are $44,552,586 and the estimated operation and maintenance costs are $14,668,908. The projected cost for the remaining capital expenditures is $6,971,000. The projected monthly operation and maintenance costs for the incinerator are $300,000. The estimated costs for thermal treatment were about $4,800,000. To date, a total of 213,000 gallons of organic liquids and fumes have been incinerated. This corresponds to a total unit cost of $280 per gallon and a unit cost for thermal treatment of $21 per gallon. Tables 6 and 7 show capital costs and operation and maintenance costs for the remedy.

Table 6. Capital Costs [7]

WBS Number		Description	Cost to Date (1/91 - 5/97)	Projected Cost
331	01	Mobilization and preparatory work	$18,159,087	NA
331	02	Monitoring, sampling, testing, and analysis	$4,310,840	$520,000
331	03	Sitework	$6,405,230	$150,000
331	05	Surface water collection and control	$2,418,588	$100,000
331	06	Groundwater collection and control	$9,285,089	$3,100,000
331	22	General requirements	$3,973,752	$3,101,000
		Total Capital Costs	*$44,552,586*	*$6,971,000*

Table 7. Operation and Maintenance Costs [7]

WBS Number		Description	Cost to Date (4/94 - 4/97)	Projected Monthly Costs
342	02	Monitoring, sampling, testing, and analysis	$1,596,888	$35,000
342	03	Sitework	$232,520	$6,000
342	14	Thermal treatment	$4,749,582	$115,000
342	18	Disposal	$92,429	$2,500
342	22	General requirements	$7,997,489	$141,500
		Total Operation and Maintenance Costs	*$14,668,908*	*$300,000*

TREATMENT SYSTEM COST (CONTINUED)

Cost Data Quality

- Actual and projected capital and operations and maintenance cost data are available from the RP for this application.

OBSERVATIONS AND LESSONS LEARNED

Observations and Lessons Learned

- Site personnel feel that there have been relatively few problems with the incinerator thus far. They have attributed this to the fact that they used all of their allowable pre-operation, or shakedown, hours to properly adjust the system in order to successfully complete the trial burn [5].

REFERENCES

1) Superfund Site Status Summaries, U.S. EPA, "Petro Processors of Louisiana, Inc.", http://www.epa.gov/earth1r6/6sf/petropro, May 9, 1997.

1) Remedial Design and Construction Plan, Petro-Processors, Inc., "Design & Construction Specifications: Operating Specification for the Liquid Mode Operation of the LTAD Incineration System, Addendum A, Volume III, Part 5, Book 10 of 17, NPC Services Inc., November 15, 1995.

1) Remedial Design and Construction Plan, Petro-Processors, Inc. "Design & Construction Specifications: Operating Specification for the Liquid Mode Operation of the LTAD Incineration System, Addendum A, Volume III, Part 5, Book 1 of 17, NPC Services Inc., November 15, 1995.

1) Remedial Design and Construction Plan, Petro-Processors, Inc. "Design & Construction Specifications: Operating Specification for the Fume Mode Operation of the LTAD Incineration System, Addendum A, Volume III, Part 4, Book 1 of 11, NPC Services Inc., November 15, 1995.

1) Personal Communication, Ms. Cynthia Kaleri, April 2, 1997.

1) Personal Communication, Mr. Bryan McReynolds, July 24, 1997.

1) Personal Communication, Mr. Marty Munley, July 28, 1997.