Finding a Market for Recovered Creosote
Green Remediation at the American Creosote Works, Inc. (Winnfield Plant) Superfund Site in Northern Louisiana

Introduction

Since its beginning in 1980, EPA's Superfund program has been committed to cleaning up the worst hazardous waste sites in the country. The Superfund cleanup process is complex, and performing a cleanup in a way that minimizes negative impacts to the environment can be challenging. The Superfund program, on both a national and regional level, has recognized that using green remediation strategies may help curtail each site's environmental footprint. EPA Region 6 applies green remediation techniques where possible to minimize the environmental impacts of Superfund cleanup.

Region 6 Green Remediation Policy: Key Objectives

- Protecting human health and the environment by achieving remedial action goals.
- Supporting human and ecological use and reuse of remediated land.
- Minimizing impacts to water quality and water resources.
- Reducing air emissions and greenhouse gas production.
- Minimizing material use and waste production.
- Conserving natural resources and energy.

One potential way of lessening the impact of a site's cleanup is by recycling materials generated at, or removed from, a site. Region 6 is applying this approach at the American Creosote Works, Inc. (Winnfield Plant) Superfund site in Winnfield, Louisiana, by selling creosote recovered from on-site ground water treatment operations for use in the wood treating industry. A first-of-its-kind effort, the project will help protect the environment and reduce site cleanup costs.

This case study explains how EPA forged an agreement with a chemical manufacturing and distribution company that will enable EPA to sell the creosote recovered from the site for use in wood treatment instead of paying to have it disposed of at a waste incinerator facility. The case study provides information on wood treating and creosote use in the United States; wood treating facilities and wood treating Superfund sites; EPA's process for identifying an alternative use for recovered creosote as part of the remedy at the site; environmental benefits of making recovered creosote available for wood treatment; factors important for making the project a success; and considerations for carrying out similar projects at other Superfund sites. This case study is intended to share lessons with EPA site managers, remedial contractors and other parties involved in creosote recovery as part of site cleanups.

Figure 1. American Creosote Works, Inc. (Winnfield Plant) site in Winnfield, Louisiana.

Wood Treating and Creosote Use in the United States

Wood treatment, also called wood preserving, is the process of protecting the structural integrity of wood from insect damage, moisture and decay. Wood treatment is critical for preserving most wood used in commercial, industrial and residential construction. This is accomplished through the application of an EPA-registered preservative solution to timber. Commonly used wood preservatives include creosote, pentachlorophenol and copper chromated arsenate.

Creosote is the name for a variety of wood preservative products. These products are mixtures of many chemicals created from high temperature distillation of coal tar. Coal-tar creosote has been available commercially in the United States for over 100 years and is still widely used in wood treatment. In large-scale wood treatment operations, creosote is typically applied under pressure in cylinders. Creosote-treated wood is used for pilings, telephone poles and railroad crossties.

Figure 2. Poles stockpiled at a former wood treating facility in Georgia.

In 1986, EPA restricted the use of creosote and creosote products to licensed applicators only. Because creosote is a pesticide, EPA regulates its use under the Federal Insecticide, Fungicide and Rodenticide Act. In addition, under certain conditions depending upon how creosote is used, creosote must be managed according to federal and state hazardous waste regulations under the Resource Conservation and Recovery Act (RCRA).

Wood Treating Facilities and Wood Treating Superfund Sites

Historically, wood treatment plants in the United States were concentrated in two distinct regions. The first extended from east Texas to Maryland, corresponding roughly to the natural range of southern pines. The second, smaller region stretched along the Pacific coast, where Douglas fir and western red cedar are the predominant species. Past improper management of toxic chemicals at wood treating facilities caused significant contamination of soil and ground water at some sites. Contamination was generally caused by excess preservative that was allowed to drip onto the ground, along with other poor waste management practices. In 1990, EPA issued the first regulations under RCRA specifically addressing many wood preserving wastes. EPA later issued rules requiring improved management of hazardous waste generated by the wood preserving industry. These regulations provide a framework for the proper management of hazardous and non-

Figure 3. Wood treating facility Superfund site in Texas.

hazardous waste, but they do not directly address the problems of hazardous waste associated with inactive or abandoned sites, or spills of chemicals that may require emergency response. Many wood preserving sites, both inactive and operating, already contain significant soil and ground water contamination as a result of years of chemical use prior to the enactment of environmental regulations. Many of them are addressed under the Comprehensive Environmental Response, Compensation and Liability Act, commonly known as the Superfund program.

Figure 4. Liquid creosote collection tank.

The cleanup of creosote-related contamination typically includes excavating contaminated soil and disposing of the soil at an off-site disposal facility or capping the contaminated material on site. Creosote is usually referred to as a non-aqueous phase liquid (NAPL), which is a liquid that does not readily dissolve in water. Cleanup of creosote in ground water frequently involves pumping the creosote-contaminated ground water, separating the creosote from the ground water, and then transporting the creosote to an off-site disposal facility. The creosote is typically incinerated at a permitted waste incinerator. Recovered liquid creosote may also be used for energy recovery to help power boilers or cement rotary kilns. The bulk of wood treating sites included on EPA's Superfund National Priorities List (NPL) are found in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee) and EPA Region 6 (Arkansas, Louisiana, New Mexico, Oklahoma, Texas). One of these sites is located in northern Louisiana.

American Creosote Works, Inc. (Winnfield Plant) Superfund Site

The American Creosote Works, Inc. (Winnfield Plant) Superfund site is located on about 34 acres in Winnfield, Louisiana. Winnfield sits next to the Kisatchie National Forest, about 50 miles southeast of Shreveport. Long before EPA began regulating the use of creosote, several wood treating companies operated at the site and used creosote and pentachlorophenol. Operations began at the site as early as 1900 and continued until the early 1980s, when the facility was abandoned. Operators included American Creosote Works, Inc. from 1938 until 1977 and the site's most recent operator Stallworth Timber Company. Years of improperly handled hazardous materials resulted in extensive soil and ground water contamination. The Louisiana Department of Environmental Quality began investigating the site in the early 1980s and turned the site over to EPA for remediation in 1987. EPA conducted immediate removal and stabilization actions in the late 1980s. EPA placed the site on the NPL in October 1992 and began site-wide remedial action in 1993.

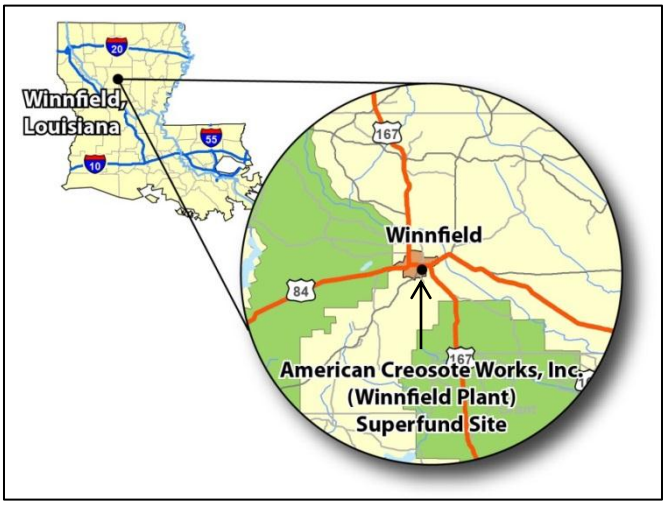


Figure 5. The site's location in Winnfield, Louisiana.

In April 1993, EPA initiated a remedy that included: pumping, separating, treating and destroying subsurface liquid contaminants and incinerating highly contaminated tars and sludges. The remedy also required using in-situ biological treatment for soils and sludges, and capping surface soils. The extraction, treatment and in-situ bioremediation components were constructed together and began operating as a single system in October 1996.

The system separates the creosote oil from the extracted ground water using an oil/water separator, a clarifier, and other processes. Before EPA began recycling the recovered creosote, system operators shipped the creosote off site to the Clean Harbors El Dorado Incineration Facility for use as a fuel to power the facility's waste-fired boiler. Located about 100 miles north of the plant in Arkansas, the permitted incinerator facility specializes in the treatment of hazardous wastes and non-hazardous wastes by high-temperature incineration.

Figure 6. On-site ground water treatment plant facility.

By December 2012, the site's ground water treatment system had treated over 87 million gallons of contaminated ground water and collected over 200,000 gallons of creosote. The site's third Five-Year Review report, completed in 2010, found that the remedy is protective. However, with an estimated 400,000 gallons of creosote remaining in the ground water, and decades more ground water pumping anticipated, EPA's site manager recognized that there could be opportunities for remedy optimization and cost savings.

Finding a New Use for Recovered Creosote

EPA was paying a disposal fee of nearly $19,000 for each 4,500-gallon tank of recovered creosote it shipped to the Clean Harbors El Dorado Incineration Facility. EPA's site manager anticipated sending numerous additional shipments of recovered creosote to the incinerator facility over the next several decades. However, if a company could be found to purchase and responsibly use the site's recovered creosote, it could lower remediation costs and possibly benefit the environment.

The site manager started by researching whether creosote recycling had been performed at other Superfund sites. Although EPA site managers had considered creosote recycling when evaluating their cleanup strategies, the EPA site manager for the American Creosote Works, Inc. (Winnfield Plant) site could not find any Superfund sites where creosote recycling had been implemented.

The EPA site manager then researched potential purchasers for the recovered creosote. One promising company was KMG Chemicals (KMG) based in Houston, Texas. The international company manufactures and distributes both specialty electronic chemicals and wood treating chemicals and is the primary distributor of coal tar creosote in the United States. The company maintains bulk creosote storage tanks along the Mississippi River near New Orleans at Avondale, Louisiana, and near Savannah, Georgia.

The EPA site manager contacted KMG in 2010 and 2011. While both parties agreed to the project in theory, it was hard to get the project moving. The site manager soon discovered that his contact with KMG was retiring so he reached out to a different KMG representative who began evaluating the potential project. Through these discussions, the site manager learned about a recent agreement that KMG had entered into with a private party. Under the agreement, KMG agreed to accept creosote recovered from the private party's cleanup efforts underway at several wood treating sites across the Midwest and Texas. KMG signed off on the agreement after the private party demonstrated that the creosote recovered from these sites met KMG's standards. The site manager and KMG used this private party agreement as a basis for further discussions.

At the same time, the EPA site manager conducted a regulatory analysis to confirm that use of the recovered creosote for wood treating would not violate or be limited by RCRA hazardous waste regulations. Under RCRA, recovered creosote is usually given a RCRA hazardous waste listing code of U051 in accordance with 40 Code of Federal Regulations (CFR) Part 261.33(f). Commercial chemical products, manufacturing chemical intermediates, or off-specification commercial products that are listed under CFR Part 261.33(f) are labeled as hazardous due to their toxicity. However, materials such as the commercial chemical products like creosote listed under 40 CFR Part 261.33(f) are not solid wastes, and thus cannot be hazardous wastes by definition when they are able to be reused as effective substitutes for commercial products as per 40 CFR Part 261.2 (e)(ii).

Figure 7. Oil/water separator inside the site's treatment system facility.

As a result of the analysis, the EPA site manager, in consultation with EPA counsel, made a preliminary determination that if the recovered creosote from the site met the specifications of the commercial creosote products of KMG, the recovered creosote would be considered recycled. It would therefore not be a solid waste according to 40 CFR Part 261.2 (e)(ii). In addition, because the recycled creosote is not a solid or hazardous waste, the site manager determined that RCRA's waste manifesting and management requirements would not apply.[1] The site manager next had to determine whether the creosote recovered from the site's treatment system matched KMG's product specifications.

[1] Transporters must still comply with all applicable transportation requirements, including Department of Transportation hazardous material regulations (49 CFR Parts 171-179).

Using Recovered Creosote for Wood Treating:
Environmental Benefits

Until recently, EPA shipped the creosote oil recovered from the American Creosote Works, Inc. (Winnfield Plant) Superfund site to the Clean Harbors El Dorado Incinerator where Clean Harbors used the creosote as a substitute for natural gas to help power the incinerator facility's waste-fired boiler. In 2014, EPA will begin shipping the recovered creosote to Avondale, Louisiana, where it will ultimately be sold by KMG for wood treatment or related uses. EPA estimates 400,000 gallons of creosote can still be recovered from the site.

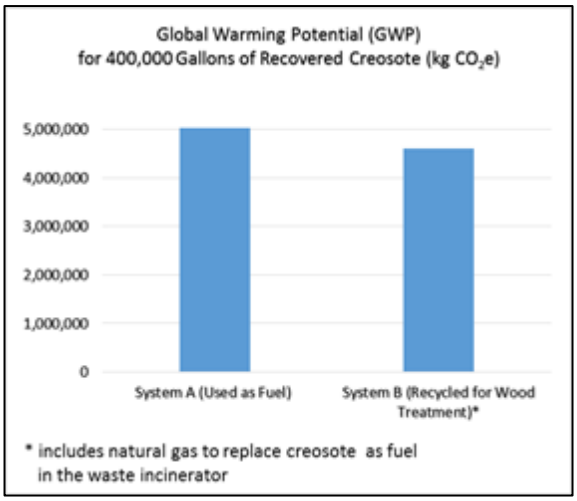
Based upon a preliminary life cycle assessment, using recovered creosote as a substitute fuel for natural gas produces about 10 percent more global warming potential, measured in kilograms of carbon dioxide equivalent (kg CO_2e), than making the recovered creosote available for wood treatment. The estimated global warming potential that would result from using the remaining 400,000 gallons of creosote as a fuel replacement for natural gas is about 5 million kg CO_2e, compared to about 4.6 million kg CO_2e associated with making the recovered creosote available for wood treatment.

Life cycle assessment methods were used to compare two systems with the same life cycle functional unit: 400,000 gallons of creosote available for wood treatment plus thermal energy equal to the energy value of 400,000 gallons of creosote. In System A, 400,000 gallons of creosote are generated for wood treatment by producing virgin creosote from coal and recovered creosote is used as fuel to operate a waste-fired boiler at the incinerator facility. In System B, 400,000 gallons of recovered creosote are available for use in wood treatment. To replace the 400,000 gallons of creosote used as fuel in System A, an equivalent amount of natural gas is used to operate the waste-fired boiler in System B.

This preliminary life cycle assessment includes the following assumptions:

- Recycled creosote replaces the same quantity of virgin creosote for wood treatment.
- The creosote recovery process is the same whether the recovered creosote is used as a fuel or recycled, with the exception of different transportation distances to deliver the recovered creosote.
- End-of-life is the same for the recycled and virgin creosote used to treat wood.

Preliminary life cycle assessment results are shown in the figure below.[1]



[1] Results derived using GaBi life cycle assessment software and the EPA-developed impact assessment methodology, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI).

To determine this, the EPA site manager acquired the set of specifications used as the basis for the private party's prior agreement with KMG and used these to evaluate the creosote recovered from the Winnfield site. The first round of recovered creosote did not meet KMG requirements; the creosote contained too much water. The site manager addressed this issue with EPA Region 6's remedial contractor, CH2M Hill. CH2M Hill adjusted the treatment system's oil/water separator to improve the separation process. CH2M Hill also took steps to better identify the oil/water interface in the creosote collection tank to avoid mixing the water and creosote when collecting the creosote. Plant personnel now siphon off water that would otherwise separate naturally in the creosote storage tank and return it back to the system for further treatment.

Following the adjustments, the EPA site manager sent an updated round of creosote analyses to KMG in January 2013. The additional water reduction in the creosote storage tank resulted in the remaining creosote meeting KMG's recovered creosote specifications. After reviewing this new round of analyses, KMG and International-Matex Tank Terminals, the company that manages KMG's creosote tank terminal in Avondale, Louisiana, agreed to receive the recovered creosote into KMG's creosote inventory. KMG also agreed to purchase the product from EPA at a cost of $100 per tank truck and work with EPA on arranging transportation. Although the tank terminal in Avondale is 170 miles further from the site than the Clean Harbors El Dorado Incineration Facility, EPA would no longer need to pay the $19,000 product disposal fee. KMG also confirmed that the purchased product will not be disposed of other than in accordance with all applicable laws. KMG additionally agreed not to hold EPA responsible for consequences from any improper handling or disposal of the product.

As a result, the EPA site manager finalized a memo for the site management file explaining that because the recovered creosote from the site meets the specifications of the commercial creosote products produced by KMG, the recovered creosote is being recycled and therefore, is not a solid waste pursuant to 40 CFR Part 261.2 (e)(ii). Likewise, because the recycled creosote is not a solid or hazardous waste, the waste manifesting and management requirements of RCRA do not apply. However, transporters must still comply with all applicable transportation requirements, including Department of Transportation hazardous material regulations (49 CFR Parts 171-179).

Figure 8. Bulk tank terminal in Avondale, Louisiana. Image source: International-Matex Tank Terminals.

The EPA site manager anticipates having the first tank of recovered creosote shipped to KMG's Avondale terminal in 2014. Prior to transporting each tank, EPA will test the recovered creosote for water content and specific gravity to ensure it meets KMG's specifications for commercial creosote. In addition, EPA will visually inspect the recovered creosote periodically to see if there are any apparent changes. If there are, EPA will perform additional testing and make adjustments to the treatment system, if necessary. According to the EPA site manager, "We are excited about the project and hope it can be replicated at other Superfund sites." He added that "there is probably always a market for recovered wastes – it is just a matter of finding it."

Factors Important for Success

There are a number of factors that helped make it possible to establish a long-term agreement with KMG and provide EPA with an alternative to shipping the recovered creosote to a waste incinerator facility.

- EPA's regulatory review provided assurances to the EPA site manager that the recovered creosote could be sold for use in wood treating.
- An agreement previously reached between a private party and KMG for reusing creosote recovered from non-Superfund sites provided a model for developing a workable agreement between EPA and KMG.
- EPA and its remedial contractor identified and undertook the necessary adjustments to the site's ground water treatment system to enable the creosote to meet the product specifications required by KMG.
- The large volume of creosote that remains to be recovered; the high cost of creosote disposal; the proximity of KMG's distribution terminal to the site; and KMG's agreement to purchase the recovered creosote from EPA together made the project economically worthwhile.
- Although the site manager wanted to reduce remediation costs by recycling instead of incinerating the recovered creosote, he was also motivated by a desire to reduce the environmental footprint of the site's environmental cleanup.
- The willingness of KMG to indemnify EPA from any mishandling of creosote by KMG provided assurances to EPA they could enter the agreement with KMG without taking on additional risk.

Conclusion

Figure 9. Wood treating facility Superfund site in Mississippi.

EPA's Superfund program encourages EPA site managers to reduce the environmental impact and cost of Superfund site cleanups where possible. At the American Creosote Works, Inc. (Winnfield Plant) Superfund site in Winnfield, Louisiana, the EPA site manager recognized an opportunity to reduce costs of site operations and reduce the cleanup's environmental footprint. Instead of continuing to pay to send the creosote recovered from the site's ground water treatment system to a waste incinerator for use as a substitute fuel, the site manager approached KMG to ask about the company's potential interest in accepting the creosote as part of the company's creosote inventory. After the EPA site manager made minor modifications to the site's ground water treatment system, the company agreed to purchase the recovered creosote. The agreement will provide immediate and long-term savings to EPA as well as an environmental benefit. The work by EPA and KMG to forge an agreement provides a foundation for other site managers wishing to pursue similar creosote recycling efforts.

Potential Creosote Reuse Opportunities for Other Wood Treating Superfund Sites

Creosote recycling does not need to be restricted to this site, the state of Louisiana or even Region 6. As stated previously, wood treating is not the only use for recovered creosote. Before EPA's agreement to ship recovered creosote to KMG for use in wood treatment, EPA shipped the recovered creosote to a permitted waste incinerator to power the facility's waste-fired boiler. Similarly, at the Koppers Co., Inc. (Charleston Plant) Superfund site in Charleston, South Carolina, recovered creosote is periodically shipped to the Giant Cement Company in Harleyville, South Carolina, for use as an energy recovery fuel in rotary cement kilns. There may also be local companies that can use creosote for energy recovery.

EPA Region 6 is currently exploring using this approach for other former wood treating Superfund sites in Louisiana. Important issues to consider before carrying out a plan to sell creosote recovered from a site's ground water treatment system for use in wood treating include the following:

- Volume of creosote that can be recovered at the site.
- Distance of the site from a creosote manufacturer/distributor.
- Willingness of the creosote manufacturer/distributor to accept the creosote as part of its creosote inventory and enter into an agreement. A central aspect of this is whether creosote collected by the ground water treatment system can meet the product specifications required by the creosote manufacturer/distributor.
- Ability to adjust the on-site ground water recovery system to enable the creosote to meet the product specifications required by the creosote manufacturer/distributor.
- Willingness of the creosote manufacturer/distributor to indemnify EPA of any mishandling of the product by the creosote manufacturer/distributor.
- Comparison between the costs and benefits of selling the product for reuse versus disposing of it through traditional methods. Elements to consider include transportation costs, disposal costs and revenue generated if the product is sold.
- Life cycle environmental benefits and costs of a "business-as-usual" scenario versus recycling recovered creosote.

For more information about recycling recovered creosote at Superfund sites contact:

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Sources and Resources

Sources
Images for this case study were obtained from EPA Region 6 and the EPA On-Scene Coordinator website (www.epaosc.org/), unless otherwise noted.

Resources

Project-Specific

Clean Harbors El Dorado Incineration Facility
www.cleanharbors.com/locations/index.asp?id=185

EPA Region 6 Superfund Program
www.epa.gov/region06/6sf/6sf.htm

International-Matex Tank Terminals
www.imtt.com

KMG Chemicals, Inc.
www.kmgchemicals.com

Life Cycle Assessment

GaBi Life Cycle Assessment Software
www.gabi-software.com/america/index/

Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI)
www.epa.gov/nrmrl/std/traci/traci.html

Wood Treating and Creosote

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EPA Green Remediation

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EPA Region 6 Clean and Green Policy
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