



## State of the Art Heavy Metal Treatment Technology and Hazardous Waste Solutions

### Heavy Metal Treatment Summary

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**ADT Environmental Solutions** has perfected a number of alternative treatment technologies for stabilizing toxic heavy metals in soils and production waste streams. ADT's proprietary stabilization systems render high levels of lead, chrome, cadmium, arsenic and other heavy metals into non-leachable, safe forms, suitable for on site disposition or off-site disposal in Subtitle D landfills or construction debris monofills. ADT's treatment technologies are effective in stabilizing metals in soils, sludge, ashes and sediments.

#### **Advantages**

Standard stabilization techniques "encapsulate" or bind heavy metals to contaminated media by adding cement with pozzolonic materials. This approach adds to both volume and mass of the treated material, is difficult to apply, costs more, and has uncertain longevity. The ADT approach involves converting the physical state of the leachable metallic and oxide forms to environmentally stable mineral and other chemical forms without adding to volume or mass, and avoiding or minimizing offsite disposal costs. The technique typically results in a cost-savings of 30 to 60% over conventional techniques and treatment results are permanent.

#### **Applications**

The technology is field- proven and commercialized for stabilizing lead, cadmium, arsenic, zinc, chromium, selenium, antimony and barium. Lab scale proof of concept work is underway on mercury. Sites of application include firing ranges, metal laden sediments, mining operations, primary steel manufacturing, ash from thermal destruction and plating wastes.

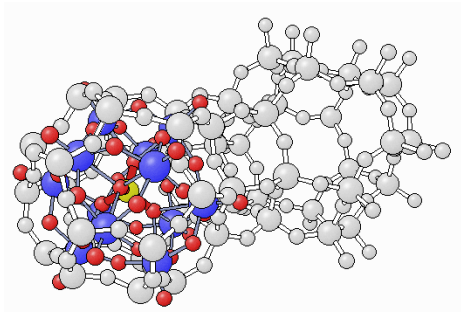


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# ADT HEAVY METAL SOLUTIONS

ADT's heavy metal treatment technology centers on a unique array of chemical reagents together with a body of remedial knowledge and experience that significantly reduces the toxicity (TCLP) of heavy metals in soil, sludge, sediment or ashes.



Federal regulation requires the removal and proper disposal of heavy metal wastes exceeding EPA minimum clean up standards. ADT's proprietary treatment methods renders regulated levels of lead, chrome, cadmium, arsenic and other heavy metals permanently into a non-leachable, safer form, suitable for leaving on site or taken off site as non (RCRA) hazardous waste.

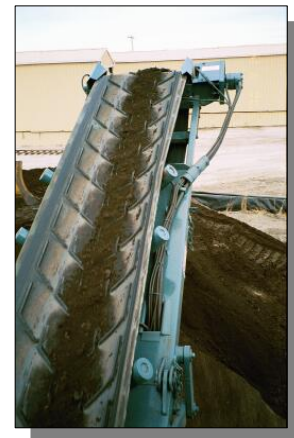


ADT utilizes a range of different chemical reagents specific to the type of contaminants combined with years of heavy metal remedial experience to produce a highly effective and permanent solution for even the most complex environmental problems.

ADT's heavy metal treatment technology has a number of distinct advantages in terms of versatility of

use, means of application, and economic benefit. These include effective TCLP reduction of one or more heavy metals, little or no increase in treated waste volumes, flexibility in application, and permanent environmental improvement.

In effect, ADT's field proven treatment technology provides a viable alternative to hazardous waste disposal.



## Simple, Cost Effective, Permanent

# VERSATILITY

Heavy metal contamination is one of the most common forms of pollution found in and around industrial sites, landfills, abandoned mining operations, and municipal and agricultural outfalls. In addition, heavy metals are used in a variety of industrial processes such as steel production, metal plating and anodizing, automobile and aircraft manufacturing, and general metal fabrication, just to name a few. Ultimately, all heavy metal wastes exceeding strict EPA environmental standards require adequate toxicity reduction and proper disposal.

## Custom Designed Treatment

Of the thousands of documented contaminated sites throughout the US and over 1.3 millions tons of reportable metal bearing process wastes generated every year. Each situation is unique having different physical and toxic characteristics. As such, there is also no one single treatment process or method (magic bean) to address every waste or site situation. However, with expertise in site remediation and years of chemical treatment experience, ADT has created a diverse array of effective treatment methods custom designed to achieve desired results for each unique situation.



For example, this versatility allows a mixed waste stream containing a combination of TCLP metals such as lead, chrome and arsenic to be reduced simultaneously.

Customized treatment reagents formulated to address specific metals can be added to generated wastes without impacting existing in house treatment processes.

ADT's custom designed heavy metal treatment also provides the highest level of assurance in terms of heavy metal reduction consistency and longevity. ADT does not promote any one specific reagent or treatment method but produces the right combination of reagents demonstrated most effective for each waste.



Whether involving phosphate or sulfate based additives, metal valiance reducing reagents, or simple pozzolonic based materials, ADT's heavy metal treatment capabilities lend for increased flexibility in addressing waste handling and disposal.

# APPLICATION

The diversity of heavy metals that can be effectively treated under a variety of site conditions makes ADT a viable remediation alternative.

ADT's treatment methodology is particularly well suited for in situ application at remote locations for both small and large scale sites or when off site transportation and disposal may be cost prohibited or impractical. In situ treatment may also be preferable on environmentally sensitive sites and ecosystems requiring minimal disruption or disturbance.

## Applications for every situation

ADT's custom treatment formulations can be applied in a liquid or solid state through highly controlled spraying, mixing, or injection. Simple physical contact with metal contaminants is all that is required to produce immediate TCLP reduction. Adequate processing can be accomplished by roto-tilling, trammeling, or mechanical mixing using standard excavation equipment. The end result is a non-leaching metal bearing waste stream with the treatment process having no negative health or environmental impacts. The ability to treat 3heavy metal contaminants on location or within existing waste treatment processes in a non-intrusive manner is another reason why ADT's treatment methods offer a viable option in solving waste management issues.

Given the wide range of application options, ADT's treatment are not restricted by site conditions or industrial processes that would normally preclude other on site treatment or remedial methods.



Advantages to ADT treatment applications include:

- Rapid mobilization and demobilization
- Minimal interference to ongoing production or operations
- Minimum space requirements
- Minimum labor
- Single event or phased project approach
- Minimum environmental disruption

# COMPARISONS

How does ADT treatment methodology compare to conventional stabilization and other methods using chemical additives?

1) ADT's heavy metal treatment technology is not tied to any one treatment product, methodology or means of application and therefore is not restricted to one or two heavy metals or specific site conditions. ADT's technology can be applied in a variety of ways under most site conditions addressing one, or a combination of heavy metal contaminants. Organic or inorganic constituents in soil and other media, including petroleum do not effect ADT's treatment. It also works in a wide range of pH conditions and is permanent.

2) Additives or reagents applied using ADT's technology adds marginal volumes, (1%–5%), to the final waste volume as opposed to standard means (30%-50%). This reduces on site set up, space requirements and equipment cost, not to mention the significant reduction in off site transportation and disposal fees.



3) ADT's technology is safe, simple and regulatory complaint while converting toxic heavy metals into a safer, naturally occurring state. ADT successfully performed field treatment for TCLP arsenic and chrome at one of the most regulatory restrictive sites in the Northwest. ADT's technology has been demonstrated at a number of EPA test sites and has been accepted at various installations as a viable technology option for military site clean ups.

4) ADT provides substantial cost reduction opportunities saving between 30 and 60 percent over conventional stabilization costs. ADT conducts extensive laboratory testing on every waste stream prior to application in the field to provide reliable results the first time around.

5) ADT's treatment technology can meet or exceed strict EPA land disposal restrictions in the field and can interface with state and federal regulatory agencies to provide a complete, compliance oriented service package to the client.

**Finally**, ADT can provide the cost, degree of toxicity reduction and the time required to complete the project before any work begins. Not only can ADT provide the technology but can also perform all aspects of site planning, remediation and subsequent disposition of treated waste.



# RESULTS

## Process Wastes

K061 is an EPA regulated waste by-product from the primary production of steel in electric furnaces. K061 can contain a variety of heavy metals including lead, cadmium and chrome. Depending on the specific process, waste K061 may also contain elevated levels of zinc, copper, and other metals that can interfere or render pozzolonic or ion specific stabilization methods ineffective. ADT was requested to conduct treatability studies on K061 waste from a steel mill and containing high levels of lead, cadmium, chrome, and zinc. Using treatment formulations that added only 2 percent to the original waste volume, ADT successfully reduced TCLP levels to below RCRA as well as below the more stringent land disposal restrictions for all metals of concern. This on site treatment process allows for off site disposal at considerably less cost.

	Pretreated Totals (ppm)	Treated TCLP (ppm)
Lead	9,200	ND
Cadmium	160	ND
Chrome	1900	0.11
Zinc	120,000	0.10

## Soil Contamination

During the 1990s, heavy metal concentrations have been identified in the Spokane River, which empties Lake Coeur d'Alene and leads to the salmon and trout spawning grounds of the Columbia River system. Following laboratory bench scale tests a stabilization method was identified for on-site confirmation of an in-situ technique that would not damage the River's banks. Specially formulated reagents were applied and testing revealing concentrations below EPA (LDR)

	Pretreated TCLP (ppm)	Treated TCLP (ppm)
Lead	57	0.15
Arsenic	25.2	<0.1
Zinc	78.9	0.72

## Waste Stockpiles and Sediments

An EPA superfund located northern California is typical of wood treating facilities that employed CCA (Copper-Chromium-Arsenate) formulations to reduce biological degradation and insect damage in structural and decorative timber. Concentrations of leachable arsenic in excess of RCRA clean up standards were identified in several areas of the plant including the upper 2-3 feet of soil in the "drip-line" area; sediments collected in storm water settling basins and soils around and under the pressure retorts used to force treating solutions into the timber. ADT conducted on site treatment using costumed formulated bulk reagents adding less than 2 % original waste volume. Treated wastes were then permanently deposited in a specially designed cell on site.

	Pretreated TCLP (ppm)	Treated TCLP (ppm)
Arsenic	278	0.15
Chrome	25.2	<0.1

# Treatable Waste Streams

Heavy Metal	Media
<b>Lead</b>	Firing Ranges Battery breaking facilities Soils – tills, clays, fine sands, coarse sands, loam, silts, etc. Wastewater Sludge – plumbing fixture mfg., TV tube mfg. Sediments – river & lake bottoms, settling basins Mineral processing waste – tailings, media separator bottoms Battery recycling debris Primary smelter slag Secondary smelter slag Steel electromelt furnace dust (K061) Petroleum refinery sludge – K048, K051, K052, tetraethyl lead Mirror mfg. waste Target range backstop soils Automobile recycling “shredder fluff” Wire chop “fluff” Foundry sands Paint sandblasting debris Scrap yard soils and storm water runoff basin sediments Municipal waste incinerator ash Abrasive mfg. debris
<b>Cadmium</b>	Wastewater sludge – battery mfg. Wastewater sludge – printed circuit board mfg. Lead & Zinc ore processing waste Automobile “shredder” fluff Battery breaking facilities
<b>Arsenic</b>	Soils & sediments at CCA wood treating plants Veterinary medicine formulation waste. Ash from thermal destruction of chemical weapons. K084 sludge
<b>Zinc</b>	Zinc ore processing waste Galvanizing process rinsewater sediments
<b>Chromium</b>	Soil at chromium ore staging site Soil around chrome plating line. Wastewater treatment sediment at bearing mfg. Cooling tower basin sediments
<b>Selenium</b>	Agricultural runoff sediment Ceramic “frit” residue
<b>Antimony</b>	Weapons mfg wastewater sediment
<b>Barium</b>	Wastewater treatment lagoon sediments

# Remediation Services

Very few environmental firms can compare magnitude of size, complexity, and diversity of hazardous waste site projects as the one's successfully completed by ADT.



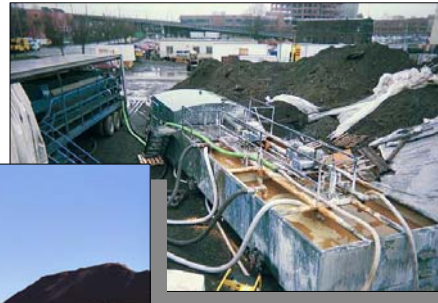
Site owners and environmental consulting firms throughout the northwest seek ADT's expertise while undertaking multi task or unusual operations requiring a refined ability to promote efficiency, foresight, innovation, compliance, safety, and budgetary restraint.

ADT's proficiency in RCRA, CERCLA, and TSCA, as well as DOT regulations allow for a smooth transition from excavation or demolition to transportation to include all aspects of disposal methodology and waste tracking.



To date, ADT has facilitated the on site removal and disposal or treatment of over half a million tons of contaminated soil and debris.

With a number of EPA and state superfund projects and hundreds of private site clean ups completed within budget and without incident, it is not surprising that ADT remains the most experienced and trusted name in the industry.



# Health and Safety

As a specialty hazardous materials handling team, ADT is fully engaged in working with a wide variety of complex solid, liquid and gaseous hazardous substances. It is critical that our employees not only understand the essence of worker safety and protection but must also be proficient in applying proper and compliant safety practices for both physical and chemical hazards both in the work place and in the field.



Our ongoing commitment to employee safety is well demonstrated in our written “performance through awareness” health and safety programs. These programs are designed not only to familiarize our employees with physical and chemical hazards in the work place but also to instill effective and conscientious safety practices in every task they perform.

***“Health and Safety are not just words, but a philosophy by which we operate.”***

Combining simulated and actual chemical handling experience with extensive classroom safety training, ADT field technicians are some of the most competent, experienced, and safety-oriented professionals in the environmental contracting industry today. As a specialty contractor for government and industry ADT is renowned for assuring the highest degree in health and safety practices and instruction.

- ADT can develop site-specific health and safety plans and programs for any situation encompassing site controls, waste management and compliance, and emergency contingency. ADT’s flexibility to effectively augment its own site-specific plans with client programs brings a unified approach for on site employee safety.

***“It is our field technicians who demonstrate ADT’s commitment to safety by every task they undertake.”***

*To find out more about ADT's heavy metal treatment technology  
and the environmental solutions we can bring to you, please contact:*

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