EVALUATION OF BLASTOX®, LEAD REDUCING SHOT FOR PAINT REMOVAL OF BRIDGES

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1.0 INTRODUCTION

Maintaining bridge structures in the United States is a major importance for the federal, state, and local governments, as well as for the general public. Concerns over the potential pollution of the environment, by lead and other heavy metals, during the removal of older paint systems from bridge structures has resulted in a variety of regulations limiting the options available for paint removal.

One option that is available for the abrasive blast removal of lead-based paint from steel, concrete, and wood structures at a significant cost savings when compared to traditional methods is Blastox®. Blastox® is a proprietary product supplied by TDJ Group, Inc. The product is a lead stabilization abrasive additive that converts lead in paint waste to a relatively insoluble lead silicate. The waste produced from the product is slated to render the heavy metals present in blasting waste non-hazardous. [1].

In maintaining the bridges in the state of Pennsylvania, the Pennsylvania Department of Transportation (PENNDOT) has to deal with the disposal of the waste debris. Because PENNDOT then becomes the perpetual owner of the blast waste debris. It is very important that the waste debris be handled in a manner compliant with applicable federal, state, and local waste management regulations. Penalties & associated clean-up costs can be debilitating. Failure to abide by applicable federal, state, and local regulations may result in long-term liabilities. [2].

Long-term stability of blast waste debris is another important issue for PENNDOT. The lead paint debris treated with Blastox® must remain non-hazardous in a landfill environment. The product is slated to render the heavy metals present in blasting waste non-hazardous to the environment. Data suggest that once treated with Blastox® the lead paint debris will remain non-hazardous to the environment while in a landfill environment. [3]

The two project locations being evaluated by PENNDOT are the Koppel Bridge and the Allegheny – Ludlum Bridge. The Koppel Bridge is located in District 11-0, Beaver County, Pennsylvania. It is on SR 0351, Section 09M (S-20165). The Koppel Bridge is a Five Multi-Stringer Span & Seven Deck Truss-Span Bridge over P & LE railroad and Beaver River. The bridge is a steel truss bridge approximately 1233.5 feet long [appendix A]

The second bridge, Allegheny – Ludlum Bridge is located in the borough of Leechburgh, District 12-0, Westmoreland County. The Allegheny – Ludham Bridge is a Through Truss Bridge over the Kiskimineas River. The bridge is a steel truss bridge approximately 699 feet long. [appendix A]

2.0 BACKGROUND

Blastox® is a blasting additive that is blended with traditional abrasive blasting media, prior to when the blasting is set to begin. The end result waste is labeled as non-hazardous under the Toxicity Characterstics Leaching Procedure (TCLP) tests. The TCLP tests consist of the rolling of the waste in a special solution and determining how much lead is leached out. The EPA requires a TCLP test to characterize spent abrasives as either being hazardous or non-hazardous.

The EPA has defined "hazardous waste" as having a lead content above 5.0-mg/1. Blastox® produces a non-hazardous waste suitable for disposal in a local subtitle D landfill may accept all special waste and may not accept free liquids. In order for a landfill to be considered as a subtitle D landfill, the state must supply a signed notification to the landfill. This must include statements attesting to the following: the waste must be non-hazardous and the waste determination was performed in accordance with federal regulations. [4]

The EPA has published a list of what it calls the Best Demonstrated Available Technologies (BDAT) for the stabilization of lead waste. Lead-based paint debris is included in this classification. BDAT stabilization technologies include "lime/fly

ash mixtures, cement, concrete mixtures, or other proprietary or non-proprietary formulations". Blastox® utilizes these chemistries. [5]

More than 20 government transportation departments, agencies, and authorities as well as hundreds of contractors and engineers have specified and/or used Blastox® .

The Army Corps of Engineers has specified and used Blastox® for their projects in several states. Two bridges in Georgia have been abated using coal slag and Blastox® GaDOT tests performed at their Trifton, Georgia facility resulted in non-hazardous waste and the laboratory approved Blastox® for use as an option. Washington, Oregon and Minnesota are just some of the states whose departments of transportation have specified and/or used Blastox® for their lead abatement projects. [3]

Consulting engineering firms in the water distribution industries such as AEC, KLM, Tank Industry Consultants, and Short, Elliot, and Hendrickson have specified Blastox® for use on hundreds of water towers and related structures throughout the United States. Shell Oil has specified Blastox® for use on several projects including off-shore platforms, refinery structures, and on-site water towers. American Electric Power, which operates in several Midwestern states has specified Blastox® blended abrasives for all of their lead abatement work and has used Blastox® successfully since 1993. [3]

3.0 DISCUSSION

According to the study, "Evaluation of Blasting Media on Red Paint Coated Bridge Structures for Lead in Air and Waste", performed by the Iowa Department of Transportation, Blastox® had a significant effect on the waste no matter which blasting media was used. [appendix C]

Three types of blasting media were used in the study; sand, starblast, and steel grit. Some mixtures contained 50 pounds of blasting material and approximately 7.5 pounds of Blastox® .

The results for the waste sample of the various blasting media is as follows:

Sand / Blastox® : Sample results indicate the waste had 1.0 ppm in the first TCLP and less than 1.0 ppm in the second TCLP.

Starblast / Blastox® : Sample results indicate the waste had less than 1.0 ppm of Lead in the first TCLP and 1.8 ppm lead in the second TCLP.

Steel Grit / Blastox® : Sample results indicate the waste had less than 1.0 ppm of Lead in the first TCLP and less than 1.0 ppm of lead in the second TCLP.

All of the results indicate that the lead levels in the waste were below the EPA allowable limits. Therefore, the waste produced by the blasting media was classified as non-hazardous. [6]

Long-term stability data indicates that Blastox® treated abrasives can pass more than five consecutive TCLP tests on the same waste sample, as well as simulations of 500 years in a landfill. Blastox® treated abrasives can also pass the Multiple Extraction Procedure (MEP) tests. The MEP test is a long-term stability test, which is designed to simulate 1,000 years of freeze and thaw cycles and a prolonged exposure to a leaching medium. The MEP test subjects a sample of the Blastox® blended abrasive to one TCLP test, then at least eight tests in an acidic solution of pH 3.0, usually a synthetic acid rain solution (sulfuric/nitric acid). TDJ Group Inc. stands by the belief that Blastox® is a stable material than can be put in a solid waste landfill and will remain non-hazardous. [3, 7, Appendix D]

Waste from Blastox® blended abrasives will remain non-hazardous because it utilizes an initial pH adjustment followed by additional stabilization reactions that produce a long-term stable waste. The stabilization of lead by Blastox® occurs in three steps:

1. The addition of Blastox® creates an alkaline environment in which Lead is stable. This elevated pH immediately stabilizes the lead.
2. Silicate reactions change the chemical form of the lead from a lead oxide, carbonate, or hydroxide to a lead silicate, which is insoluble.
3. Hydration reactions encapsulate the waste into a cementitious mass, Which limits the gravitational flow of water.

These reactions occur simultaneously. Each reaction is equally important in the stabilization of the lead waste. The silicate and hydration reactions promote the long-term stability of the waste. The end result of the three reactions is an encapsulated, insoluble lead silicate. The change in alkalinity (pH) is a by-product of the silicate and hydration reactions and is not the primary stabilization reaction. The resulting lead silicate will not leach into acidic, neutral, or basic solutions. The reactions are not reversible. If Blastox® is present, the lead will be converted to a lead silicate and then become insoluble. [5]

4.0 CONCLUSIONS AND RECOMMENDATIONS

This study investigates the long-term stability of lead paint debris treated with Blastox® in a landfill environment. After researching various resources, the following conclusions and recommendations can be drawn from this study:

1. After numerous Toxicity Characteristic Leaching Procedure (TCLP) tests and Multiple Extraction Procedure (MEP) tests, Blastox® effectively binds the lead and the resulting waste typically tests below regulatory limits.

2. Waste containing Blastox® blended abrasives will remain non-hazardous because it utilizes a pH adjustment followed by additional stabilization reactions that produce a long-term stable waste.

3. A laboratory accredited by the American Industrial Hygiene Association (AIHA), or the American Association for Laboratory Accreditation (A2LA) or a laboratory that has a comparable state accreditation must be selected for testing. [8]

Once a laboratory is chosen, request the laboratory to report initial pH, pH after hydrochloric acid addition and final pH of extract. Requesting the laboratory to report these findings will help limit flawed results, which may cost unnecessary expenses or lead to disposal decisions, which are not environmentally sound. [8]

Blastox® has been successfully used on a wide variety of projects, by various government transportation departments, agencies, and authorities, as well as a variety of contractors and engineering companies. It is a stable material that can be put in a solid waste landfill and remain non-hazardous.

5.0 REFERENCES

[1] Technical Bulletin TB-005 Issued 1-98, Blastox and Airborne Lead Particulate, The TDJ Group, Inc.

[2] http://www.kleenindustrialservice.com/risks.html

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[4] Technical Data, TD-001 Revised 6-97, The TDJ Group, Inc.

[5] Technical Bulletin TB-006 Issued 1-98, Blastox Stabilization Reactions, The TDJ Group, Inc.

[6] Evaluation of Blasting Media on Red Lead Paint Coated Bridge Structures for Lead in Air Waste, Iowa Department of Transportation

[7] http://www.minerals.com/enviro-blend/leaching.html

[8] Technical Bulletin TB-002 Revised 7-98, Laboratory Testing of Spent Abrasives, The TDJ Group, Inc.

[9] Technical Bulletin TB-004 Revised 8-97, Management of Paint Water Residue, The TDJ Group, Inc.

[10] "Demonstration of Lead-Based Paint Removal and Chemical Stabilization Using Blastox, " US Army Construction Engineering Research Laboratory (USACERL), October 1996.

[11] "User Guide and Specification for Using Blastox to Remove and Stabilize Lead-Based Paint," Draft Report, USACERL, February, 1995.

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