

**WIRTZ DAM: A POLLUTION PREVENTION CASE STUDY INVOLVING THE FIELD  
ENCAPSULATION OF LEAD BASED PAINT.**

For  
The National Pollution Prevention Roundtable  
1995 Fall Conference  
Miami Beach, Florida

by  
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December 6, 1995

## **Introduction:**

**This paper documents the progress made by the LCRA in the development and implementation of a single pollution prevention project that reduced environmental impacts associated with the repainting of an existing steel structure containing lead based primers. The project provides some guidance for all industries that may be faced with similar situations. The project was completed as part of a larger effort by the LCRA to foster the development of cost-effective, innovative multi-media, pollution prevention options for electric utilities. The pilot program is known at the LCRA as the Pollution Solution Program.**

## **The Wirtz Dam Overview:**

In July 1995, the Lower Colorado River Authority (LCRA) successfully completed its most challenging pollution prevention project, saving more than \$250,000 in materials, labor and waste disposal costs. The project involved the repainting of approximately 55,000 square feet of steel associated with the superstructure system located above the floodgates of the LCRA's Wirtz Dam facility. The LCRA's hydroelectric and environmental departments were challenged by the facility's environmentally sensitive location and the high levels of lead and chrome within the existing coatings system.

The LCRA's hydroelectric department had previously bid the project in 1994 and determined that conventional abrasive blasting and surface coating methods had the potential to generate more than 82 tons of hazardous waste and cost the LCRA more than \$750,000 to complete. When rebid in 1994, the Wirtz project took only 42 days, generated 5 tons of hazardous waste and cost the LCRA \$411,000 to complete. The cost savings and waste reductions achieved were the result of LCRA's selection of an innovative hydroblasting technology combined with an advanced moisture-cured urethane, surface-tolerant coating. The LCRA's project team had previously reviewed all possible options that would safely remove the lead paint, reduce environmental and worker health impacts and have a cost savings to the LCRA and its wholesale electric customers.

The Wirtz project team involved personnel from LCRA's Wirtz Dam and LCRA's engineering, environmental, health and safety departments. The preparation of the Wirtz Dam project started back in June 1994, when some basic changes were made to the Wirtz bid document. The most significant change to the bid document redefined the term "Lowest Cost to the LCRA" to include both waste management and disposal costs. Previous bid documents/contracts at the LCRA were awarded to the apparent low bidder but did not capture estimated waste management and disposal costs. Other added language offered incentives and penalties if contractors came in under or over with their waste generating estimates.

The project team looked at the factors driving costs and determined that they were associated with the location of work to be performed, containment of hazardous lead dust and disposal of all hazardous blasting materials. The team decided to examine the condition of the surface coatings a little closer. Visual

inspections determined that in most cases the alkyd top coat was in poor condition; however, the underlying lead and/or chrome based primers appeared to exhibit good adhesion qualities and were considered to be in relatively good shape. Field encapsulating possibilities were investigated to determine if various surface-tolerant coatings could be applied directly over the existing coatings.

The project team determined that field encapsulation of the existing lead and chrome primers could be a viable option for the LCRA if the service life of the overcoating system could be extended by minimizing the risks of delamination. It appeared that if the existing surface coatings could be selectively removed so that only the lead and/or chrome based primers with good adhesion remained, delamination risks could be reduced and service life could be extended. The team investigated further and learned of a technology that would allow the removal of lead paint only when necessary, generate low levels of lead dust and potentially produce only 1,700 pounds of hazardous waste. In addition to the lead removal process, the team also selected a field encapsulating paint product that was a low volatile organic carbon (VOC ), single component, moisture cured urethane. Everything sounded to good to be true, so the team set up a pilot test at the Wirtz Dam where the new lead paint removal technology and paint coating systems could be tested.

### **Wirtz Pilot Test:**

The pilot test was conducted Feb. 9, 1995, by the LCRA project team to determine if the hydroblasting technology selected could provide a comfortable level of surface preparation for long term field encapsulation of the existing lead and/or chrome based primers. The technology that selectively removed the surface coatings, including the lead and/or chrome primers, was demonstrated by Cavi-Tech, Inc. of Atlanta, Georgia. Cavi-Tech demonstrated their Cavi-Blast system, a 20,000 psi, interrupted flow, hydroblasting technology that removed existing paint one layer at a time, removed rust and scale and could blast to bare steel if needed. In addition to the selective removal, the Cavi-Blast left a good anchor pattern on the surface of the remaining paint. All other hydroblasting technology reviewed by the LCRA project team did not have this capability.

During the pilot test, the hydro-blasting standards developed by Cavi-Tech were demonstrated on the existing coatings. These standards were based on the level of coatings and corrosion removal. Existing coatings were subjected to various blasting levels and the subsequent surface profiles were demonstrated. The first involved simply removing most of the loose top coat and all corrosion except tightly adherent rust scale. The second involved complete removal of both the top and intermediate coating, leaving only very tightly adhered primer. All existing corrosion was completely removed. The first standard was rejected from consideration as the bonding between the top/intermediate coating and the primer were not sufficient to provide a sound surface on which to overcoat. At the second standard, the remaining lead/chrome primer was found to be extremely sound. It was noted that the Cavi-Tech process could not profile new steel. The profiles left on the surface of bare steel were from abrasive blasting activities conducted many years ago.

All test patches using the various blast levels were repainted using a single-component, moisture-cured

urethane system manufactured by Wasser High-Tech Coatings of Kent, Washington. The moisture-cured urethane utilized a micaceous iron oxide, zinc-filled, surface-tolerant urethane primer, followed by a high-solids urethane mastic intermediate coat designed to use over red lead or other previously painted surfaces. The top coat contained a unique micaceous iron oxide, aliphatic urethane. After the paint dried, which took less than one hour between coatings, the LCRA performed an adhesion test at each blast site. The tests indicated excellent adhesion between the Wasser coatings and the underlying lead primers at the sites where Cavi-Tech's high-stress profile had been used. The results of the pilot test indicated that the high-stress Cavi-Blast would only leave lead and/or chrome based primers in areas that were tightly adhered and all other lead and/or chrome based primers would be removed, extending service life and reducing the risk of delamination substantially.

### **Wirtz Project Summary:**

The Wirtz project was rebid in May 1995 by the LCRA's hydroelectric department. The bid document was revised to specify surface preparation requirements, field encapsulation of the structure and a single-component, moisture-cured urethane coating system. The bid documents specified either hydroblasting or abrasive blasting methods of surface preparation and an extended warranty on all work performed. The bids were evaluated by the LCRA, which included lump-sum contractor costs, waste disposal estimates and extended warranty information. The average bid price to field encapsulate with a five-year warranty was \$568,578. The high bid was \$670,920 and the low bid from Cavi-Tech was \$395,417.

Cavi-Tech mobilized on site May 22, 1995, and set up scaffolding around the superstructure. The scaffolding also served as the framework for several water-tight containment systems that were constructed in modular fashion. Cavi-Tech was informed by the LCRA that containment structures could not obstruct access to the floodgates or the hoist system in case the floodgates had to be raised. As it turned out, heavy rains in the area created a flash flood situation, requiring several of the flood gates to be opened. Cavi-Tech was able to move containment and equipment with relatively short notice.

Pollution prevention opportunities associated with both the Cavi-Tech process and Wasser's moisture-cured urethane coatings were extremely good. All blast water used in the process were recycled through a closed-loop system. The water used was first contained and collected, then pumped to a reservoir tank. The return water was then passed through a cross-flow filtration system and sent back to the blasting pump before returning back to the blast nozzle. The circulating system was changed out once during the project, generating 7,500 gallons of nonhazardous waste water (total lead below 0.306 mg/l). The wastewater was sent to a publicly owned treatment works (POTW) at no additional cost to the LCRA.

The only hazardous waste generated from the process was 5 tons of spent cross-flow filters and some sludge removed from settling tanks used in the water circulating system. The filters and sludge were incinerated, costing the LCRA \$9,960 in waste management disposal. The new paint coatings also had significant pollution prevention components. The Wasser coatings were high in solids and contained approximately 2.8 pounds of VOCs per gallon compared to conventional epoxy coatings that contained

approximately 7.5 pounds of VOCs per gallon, reducing VOC emissions by more than 87 percent. The Wasser coatings also had an extended pot life (as long as it was kept away from moisture), reducing the potential volume of paint waste that could have been generated. Traditional two-part epoxies that require mixing often have a short pot life and cure before being completely used.

The Wasser products also saved Cavi-Tech time during the application process. The single- component, moisture-cured urethanes were easy to use and quick to dry. The added benefits, which improved production rates, included no dew point or temperature restrictions. Most other paint products have dew point and temperature restrictions that slow down production rates during application. Traditional two-part epoxies are generally low in solids and would cover approximately 30 percent less surface area per gallon than the high solids Wasser coatings.

Significant savings in project costs also were attributed to reduced health risks associated with the generation of hazardous lead dust. Due to the wet method of surface preparation used by Cavi-Tech, and Cavi-Blast generated particulate size, low levels of lead exposure (12- 15 ug/<sup>m3</sup>) were expected at the blast face. The LCRA performed air monitoring within work areas to confirm that lead levels were well below the OSHA action level of 30 ug/<sup>m3</sup> average for an eight-hour day. The LCRA personal monitoring data confirmed that levels of lead were consistent with historical data supplied by Cavi-Tech. The LCRA data ranged between 5 and 19 ug/<sup>m3</sup> for lead.

## **Conclusions:**

The Cavi-Tech process combined with the Wasser Coatings's single-component, moisture-cured urethane will be used again by the LCRA. The Cavi-Tech process can be used in almost any application where existing steel structures require repainting. The Wasser coatings have many applications, especially when steel structures in damp, cold or adverse environments are being considered. The combination of the two technologies becomes truly cost-effective when lead and/or chrome based primers are present. The Cavi-Blast system generally results in low levels of hazardous lead dust and reduces hazardous waste volumes by more than 90 percent. The use of Wasser's single-component, moisture-cured urethanes will save contractors costly downtime due to dew point and temperature restrictions. The Wasser coatings also provide excellent corrosion protection and service life, especially when used to field encapsulate lead-based paint.

The waste reductions and cost savings associated with this project clearly demonstrate that pollution prevention pays. It should be noted that several LCRA employees on the Wirtz project team were recognized for their efforts by the LCRA through a company-wide awards program that recognizes employees that "Make a Difference." For more information on the Wirtz project, please contact Mark L. Johnson, the LCRA Pollution Prevention Program coordinator at (512) 473-3200 Ext. 2868.