Application of Epoxy Based Coating Instacote® on Waste Tank Tops

by

J. A. Pike

Westinghouse Savannah River Company
Savannah River Site
Aiken, South Carolina 29808

RECEIVED

MAY 06 1998

OSTI

MASTER

DOE Contract No. DE-AC09-96SR18500

This paper was prepared in connection with work done under the above contract number with the U. S. Department of Energy. By acceptance of this paper, the publisher and/or recipient acknowledges the U. S. Government's right to retain a nonexclusive, royalty-free license in and to any copyright covering this paper, along with the right to reproduce and to authorize others to reproduce all or part of the copyrighted paper.

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from (615) 576-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

WSRC-TR-98-00101
Revision: 0
Publication Date: 3/16/98

Application of Epoxy Based Coating Instacote® on Waste Tank Tops

J. A. Pike

Keywords: Waste Tank
Coatings

Classification:

Not Required for HLWM Information
Authorized Derivative Classifier

Application of Epoxy Based Coating Instacote® on Waste Tank Tops

J. A. Pike

Publication Date: March 16, 1998

Jeff Pike
J. A. Pike, Senior Engineer, HLW Engineering

Date: 3/12/98

R. C. Fowler
R. C. Fowler, Technical Reviewer, Principal Engineer, HLW Engineering

Date: 3/12/98

Michael C. Chandler
M. C. Chandler, Manager, HLW Engineering

Date: 3/12/98

Bryce R. Hess
B. R. Hess, Manager, HLW Engineering

Date: 3/12/98

G. D. Thaxton
G. D. Thaxton, Manager, HLW Engineering

Date: 3/16/98

M. S. Miller
M. S. Miller, Manager, HLW Engineering

Date: 3/12/98

T. M. Monahon
T. M. Monahon, Manager, HLW Engineering

Date: 3/13/98

ABSTRACT

This evaluation examines the compatibility of the coating Instacote®-ML with existing High Level Waste facilities and safety practices. No significant incompatibilities are identified. The following actions need to be completed as indicated when applying Instacote® on waste tank tops:

1. Prior to application in ITP facilities, the final product should be tested for chemical resistance to sodium tetraphenylborate solutions or sodium titanate slurries.
2. Any waste contaminated with Part A or B that can not be removed by the vendor such as for radiological contamination, HLW must hold the waste until HLW completes a formal assessment of the waste, disposal criteria, and impact.
3. Prior to the start of any application of the coating, each riser needs to be evaluated for masking and masking applied if needed.
4. At the conclusion of an application actual total weight of material applied to a waste tank needs to be documented and sent to the tank top loading files for reference purposes.
5. Verify that the final product contains less than 250 ppm chloride.

TABLE OF CONTENTS

ABSTRACT	ii
TABLE OF CONTENTS	iii
INTRODUCTION	1
BACKGROUND	1
RESULTS AND DISCUSSION	2
PRE-APPLICATION	2
<i>Surface Prep</i>	2
<i>Adhesion to Aggregate/Other Surfaces</i>	2
<i>Environmental Spill Issues</i>	2
<i>Handling Solid Waste (during and after application)</i>	2
<i>Functional Classification (GS)</i>	3
<i>IH/Exposures/Controls</i>	3
APPLICATION	3
<i>Tank In Leakage</i>	3
<i>Ambient Conditions</i>	4
POST APPLICATION	4
<i>UV/Radiation Resistance</i>	4
<i>Touch up Repair, Removal, Surface Renewal/Reconditioning</i>	5
<i>PM Requirements</i>	5
<i>Suitability/Compatibility with Environment (heat, pH, etc.)</i>	5
<i>SS Corrosion (chloride content)</i>	5
<i>Tank Top Loading</i>	5
CONCLUSIONS (RECOMMENDATIONS AND REQUIREMENTS)	6
REFERENCES	6

INTRODUCTION

Facility Decontamination and Decommission personnel are promoting a new alternate radioactive contamination control coating for site use. High Level Waste H-Tank Farm (HTF), F-Tank Farm (FTF), and In-Tank Processing (ITP) facilities desire to use this alternate contamination coating system in areas that are known contamination problems. The coating will encapsulate existing contamination and exhibit properties favorable to existing routine decontamination practices.

BACKGROUND

Epoxy coatings in general consist of two parts which are mixed at the time of application to form a final product. When mixed, the two parts chemically react to form a polymeric compound that is essentially inert to the environment. The individual parts are very reactive which is key to any epoxy application working as intended.

The specific product to be used in Tank Farm facilities consists of an isocyanate mixture, Part A, and an amine resin mixture, Part B. Part A is very reactive and is relatively hazardous to handle. Part B is somewhat less hazardous to handle, but must still be handled very carefully. Once mixed, the reaction proceeds very rapidly and is generally cured within 30 seconds. The final product is benign, non-reactive, and non-hazardous.

The two parts are staged in 55 gallon drums near the area that will be sprayed. A specifically designed proportioning machine will pump the two parts through separate hoses to a mixing sprayer. The drums, proportioning machine, and hoses are heated to keep the material above Part A melting temperature, 99° F, and to keep the material viscosity reasonably low. At the mixer-sprayer the material reacts quickly and is actually a gelatinous solid when it leaves the sprayer. The material hardens within 30 seconds.

The Instacote® epoxy coating will seal existing contamination on waste tank tops. Once sealed, the contamination would become "fixed". The coating also provides a better decontamination surface than concrete or other coatings used on the waste tanks. This coating will also be sprayed on some contaminated steel surfaces, but will not necessarily improve decontamination properties of stainless steel surfaces. This coating was identified because of its weathering resistance and its specific design for contamination control. The vendor provides a 10 year warranty for the life of this coating which is longer than the actual average life of coats used currently. RCO expects most of the contaminated areas treated to be down graded from high contamination area or contamination areas to a lower control condition.

This evaluation examines the compatibility of the coating with existing High Level Waste facilities and safety practices. Most of the evaluation relies on vendor literature and contact with the vendor for information related specifically to the intended coating, Instacote®-ML.

The evaluation is divided into 3 general sections, pre-application, application, and post-application. Specific areas of consideration divide each general section.

RESULTS AND DISCUSSION

Pre-Application

Surface Prep

All surfaces to be coated need to be cleared of any loose materials, clean and dry. Any water present will tend to produce poor coating results. The coating will adhere reasonable well to unprepared steel surfaces or previously painted or primed surfaces. The coating will adhere best to steel prepared with a coarse 2 mil profile. Individual inspection and evaluation of any steel components to be coated needs to be completed prior to the activity. Previously coated surfaces should be roughened to assure good adherence. Application procedures already incorporate any necessary surface preparation actions.

Adhesion to Aggregate/Other Surfaces

Instacote® adheres readily to a wide range of surfaces. Very good adhesion is demonstrated on concrete, steel, aluminum and wood. The final product is flexible and exhibits reasonably high tensile strength that even if the coating does not adhere well to aggregate or other small objects on the surface, the coating will surround and bridge the area with sufficient strength to survive a reasonable life. However, this coating should not be used to bridge holes, gaps, or any other area without a substructure. Application procedures already incorporate any necessary precautions.

Environmental Spill Issues

Existing spill response procedures are adequate to cover any spills of this material. Spill controls and similar issues will be covered explicitly in the Job Hazards Analysis (JHA). A JHA is performed prior to a specific activity and is intended to formally address personnel and industrial safety issues and concerns with all personnel involved with the activity.

Handling Solid Waste (during and after application)

Part A and B are individually RCRA hazardous as waste. Currently, High Level Waste (HLW) is not certified to handle incidental solid waste generated from Part A or Part B materials. All job control waste contaminated with the Part A, B, or cleaning solution, unused materials, and packaging must be disposed of by the vendor or contractor. If any waste can not be removed by the vendor such as from radiological contamination, HLW must hold the waste until HLW completes a formal assessment of the waste, disposal criteria, and impact.

Once reacted, the material is non-hazardous and may be disposed of on site. Laboratory analysis shows that the final product is within the solid waste WAC 3.17 limits, WAC 3.13 limits, and 40CFR268.48. No additional controls are necessary.

Functional Classification (GS)

Waste tank tops are currently classified as CP for structural integrity. Since this coating is applied to the surface and the tank top will not be penetrated, the coating is classified as GS.

IH/Exposures/Controls

Industrial Hygiene will monitor and control worker exposure to materials used for this coating application. Exposure controls and similar issues will be covered explicitly in the Job Hazards Analysis (JHA). A JHA is performed prior to a specific activity and is intended to formally address personnel and industrial safety issues and concerns with all personnel involved with the activity.

Application

Tank In Leakage

The final product of Instacote® coating is relatively non-reactive. The two precursor chemicals are very reactive, and precautions must be taken to avoid allowing any potentially large spill into a waste tank. Equipment and chemical setup will inherently prevent any large spill from reaching a waste tank. The chemicals are staged off the tank top on a spill containment pallet. Part A chemical will solidify (99° F melting point) quickly if spilled to the ground and not flow readily. Part B is very viscous and will not flow quickly. Small spills may occur at the tank top if the hose fails or the spray gun fails. Though not likely, these spills would occur at low flow rates and the total spill limited in volume because the proportioning machine pumps at a maximum flow of about 3 gpm and operating personnel will continuously man the machine to stop the flow immediately upon such an occurrence. Such small volumes of Part A would solidify essentially on contact with the tank top. Part B will not flow readily because of the viscosity and such low volumes will be easy to contain.

Pathways into a waste tank include ventilation and risers. The ventilation system is elevated from tank top level, thus, no spills will flow into the ventilation. If over spray of the final product drifts into the ventilation inlet or outlet, no damage will result since the product gels within 2 seconds and the coating is compatible with the steel duct work. Potential over spray may produce small droplets that harden and then behave as any other air borne solid particle. As with all air borne solids, these particles may be drawn into the ventilation system and trapped by the HEPA filter.

Generally riser tops are elevated from the tank top and any spills will not flow into a waste tank. Tank risers contain a main plug and usually one or more smaller insert plugs. The design of the smaller inserts can have a raised lip that is designed to prevent rain water in leakage which would also prevent any minor spill from the spraying operation from leaking into a waste tank. Some of the inserts are flush with the riser plug top. The gap between the riser wall and the riser plug is usually sealed with a gasket and consists of a relatively torturous path (at least 3 90° bends). Any masking of such riser must be determined on each individual riser prior to starting the coating process. The individual evaluation needs to consider where the material is staged, where material will be sprayed, and where the hose to the spray nozzle will be positioned.

The final reacted product is very unlikely to penetrate these potential pathways because of the very short cure time. Over spray will not affect any of the tank risers or reach the waste. Masking of waste tanks may be done for aesthetics or limit the spray to a very specific area. Mask may also be used on junction boxes if the coating could interfere with access to the junction box.

Intrusion of Instacote into junction boxes or conduits is also unlikely due to its fast reaction time. Therefore, interference with alarm circuitry (i.e. conductivity probes) is not expected.

The coating is compatible with the material of construction of piping, structural steel, conduit, junction boxes, etc. so no special precautions need to be made for over spray for these tank top components. Furthermore, any of these components may be coated if desired.

Ambient Conditions

Outdoor application should be made in fair weather with ambient temperatures above 40° F and no standing water or rain. Best curing conditions occur above 70° F. Generally, day time application is necessary in the winter months and heat stress conditions need to be considered for summer months.

Post Application

UV/Radiation Resistance

Radiation test data indicate fairly good radiation resistance, better than most types of rubber and at least as good as polycarbonate (Plexiglas). None of the areas on tank tops have radiation areas that will challenge this materials radiation resistance.

Ultraviolet (UV) radiation resistance is not as well documented, but offers significantly better resistance than most of the coatings currently in use. Instacote® contains specific additives to enhance UV resistance which should increase the probability that this coating will last at least as long as warranted.

Instacote is available in several color choices. The use of one color scheme over another does not impact the performance of the coating or UV protection properties. The choice of using a particular color coating should be left to the discretion of the facility.

Touch up Repair, Removal, Surface Renewal/Reconditioning

No special procedures are required to touch up and repair. This coating should be treated similar to any other tank top coating that could be applied. No chemical reconditioning of the surface is necessary. If desired in the future, any such treatment will be reviewed as a new activity under existing procedures.

PM Requirements

Instacote® is more resilient than the existing paint systems used on waste tanks. The coating is warranted for 10 years and some outdoors test sprays performed at the SRS indicate good weathering characteristics. Vender information indicates good weather resistance and durability. No additional scheduled preventive maintenance is required.

Suitability/Compatibility with Environment (heat, pH, etc.)

Instacote® as well as nearly all other polyurea epoxy coatings exhibit high flexibility and good weather resistance. Thermal shocks and naturally high and low temperatures, -30 to 120° F, has no significant affect on physical properties of the final product. Chemical resistance is quite good generally and resists all chemicals commonly used around waste tanks. This coating was not tested for resistance to sodium tetraphenylborate solutions or sodium titanate slurries as used in In-Tank Precipitation (ITP) facilities. Though resistance to these chemicals is very likely given existing test data on chemically similar compounds, specific testing should be done prior to any application on or near ITP facilities that use or store these two chemicals.

SS Corrosion (chloride content)

None of the components contain chloride as part of the ingredients. Though not expected to contain any significant chloride content, the material should be verified prior to application to any stainless steel components to contain less than 250 ppm.

Tank Top Loading

Waste tank top loads are tracked for the purpose of preventing over stressing the waste tanks. Generically, permanent loads over 500 lb. should be technically reviewed for acceptable loading. This coating may add as much as 2000 lb. from a single tank application (controlled by total amount of available material to spray).

The tank top load program focuses on point loads for over stressing concerns. Since the load is well distributed, this load added by this coating is acceptable. The final weight added by the coating needs to be document and a copy added to the tank top loading files for future reference.

CONCLUSIONS (RECOMMENDATIONS AND REQUIREMENTS)

The following items need to be completed as indicated when applying Instacote® on waste tank tops:

1. Prior to application in ITP facilities, the final product should be tested for chemical resistance to sodium tetraphenylborate solutions or sodium titanate slurries.
2. Any waste contaminated with Part A or B that can not be removed by the vendor such as for radiological contamination, HLW must hold the waste until HLW completes a formal assessment of the waste, disposal criteria, and impact.
3. Prior to the start of any application of the coating, each riser needs to be evaluated for masking and masking applied if needed.
4. At the conclusion of an application actual total weight of material applied to a waste tank needs to be documented and sent to the tank top loading files for reference purposes.
5. Verify that the final product contains less than 250 ppm chloride.

REFERENCES

1. "Instacote®-ML", Master-Lee Decon Services, Latrobe, PA
2. "Health and Safety Program for Instacote® Applications", Instacote®, Inc., Erie, Michigan, October 1996
3. Primeaux II, Dudley J., "Polyurea Spray Technology in Commercial Applications", from vendor provided literature
4. "Instacote® Training Manual", Master-Lee Decon Services, Latrobe, PA
5. "Irradiation Studies of Instacote®, Inc. Coatings" Master-Lee Decon Services, Latrobe, PA

6. "Master Lee Decon Services Volatiles Analysis for Instacote®", Master-Lee Decon Services, Latrobe, PA
7. "Procurement Specification for Instacote® Process Coating System", Q-SPP-C-00007, Rev. 0
8. "Corrosion Evaluation: Stainless Steels and Other Corrosion Resisting Alloys", Engineering Standard 05951, WSRC-TM-95-1