

TECHNOLOGY@ROCKY FLATS

Demonstration & Deployment Summary

Structural foam/encapsulant for leaded gloveboxes cuts worker risk and project cost

Summary

More than 1,300 gloveboxes contaminated with plutonium, uranium and americium must be disposed of to successfully decommission and demolish Rocky Flats' four remaining plutonium buildings. Most gloveboxes contain lead as radiological shielding in the form of leaded gloves, leaded glass and lead flashing. To meet waste disposal criteria to ship gloveboxes as low-level radioactive waste, workers were required to undertake the high-hazard and labor-intensive activity of removing all lead prior to disposal. With the continued success of chemical decontamination techniques, the Building 371 D&D Project successfully reduced contamination to levels acceptable to the Envirocare low-level mixed waste receiving site in Utah. One requirement of Envirocare's waste acceptance criteria is that all void spaces inside waste containers be eliminated to prevent crushing or shifting once they are placed in an Envirocare burial cell. Also, all lead must be macro-encapsulated on all sides to RCRA specification. Developing a structural foam to meet these cri-



teria allows the project to significantly reduce cost and hazards to workers.

The Need

Waste generators like Building 371 at Rocky Flats must remove lead and lead-containing components from gloveboxes and dispose of them in separate waste streams. Lead removal is a labor-intensive and costly operation with potential for worker injury and unnecessary exposure of workers to radiological and hazardous materials. Furthermore, Building 371 is on critical path to site closure.

The Technology

The project included the initial investigation of the technical and regulatory feasibility of deploying the process, collaborating with Envirocare on the development of the material properties of the foam to meet its waste acceptance criteria, collaboration

with a foam supplier to select or formulate foam to meet requirements of the disposal site, procurement of equipment, training, process demonstration and deployment.



Workers spray structural expanding foam inside a glovebox at Rocky Flats. When hardened, the foam meets Envirocare acceptance criteria for crush resistance and integrity.

With assistance from DOE's Office of Science and Technology, a commercial supplier began work to formulate a spray foam of sufficient load-bearing and encapsulation properties to meet Envirocare waste acceptance criteria. It would be similar to foam currently used for blocking and bracing of components in waste containers but of sufficient high density to meet the

“no void space” requirement. In addition to dense packing, the material would need to demonstrate crush and fire resistance.

The resulting technology was based on a product of the Instacote™ company called BASF Autofroth™. BASF AutoFroth™ has been engineered to meet the requirements of Nuclear Regulation 1608. AutoFroth™ is a structural expanding foam and is used to block and brace large items in waste packaging including liquid process tanks and cargo containers. AutoFroth™ stabilizes equipment and loads from tipping, sliding and shifting during handling and transport.

The new formulation was successfully tested using a triaxial compression strength test per ASTM standards to 100 psi compression. The liquid Autofroth turns to a solid in two minutes and 10 seconds, meeting acceptance criteria for no liquids in the waste unit. Like Autofroth used in cargo container foaming, the hardened foam adheres to and stabilizes any residual contamination inside the glovebox and effectively macro-encapsulated any lead-bearing items.

In addition, the foam material minimized weight of the final package, weighing only 3.95 pounds per cubic foot. Grouts commonly used in the nuclear industry weigh 80-to-90 pounds per cubic foot.

Results and Benefits

The Building 371 Project successfully foamed and shipped several contaminated gloveboxes with lead intact to Envirocare, significantly reducing cost and hazards associated with the previous practice of manually removing all lead prior to shipment.

The need to dispose of more than 200 glovebox equivalents, labor savings are expected to exceed \$500,000 just for the Building 371 D&D project.

Rocky Flats attempts to find a way of disposing of gloveboxes without first manually removing all leaded components was cited as an example of exemplary performance in DOE's Environmental Management “Top to Bottom” report of February 2002.

For future gloveboxes, the Project has opted to subcontract interior foaming of gloveboxes to Envirocare rather than perform the work in-house.



Above, a Building 371 glovebox has been foamed, packaged and is prepared for shipment to Envirocare. In addition to greatly reducing the amount of time a worker spends in close proximity to a contaminated object, eliminating the need to peel away an outer layer of a glovebox to expose and then peel away the lead significantly reduces the probability of puncture wounds or cuts, the leading cause of internal contamination.



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Technology Supporting the Path to Closure

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