Honeywell

Britz-Heidbrink Inc. Mini-CRADA

Powder Coating of Animal Enclosures

Federal Manufacturing & Technologies

M. D. Smith

KCP-613-6196

Published January 2000

Final Report/Project Accomplishments Summary

CRADA Number 96-KCP-1040



Prepared Under Contract Number DE-ACO4-76-DP00613 for the

United States Department of Energy

Honeywell

Federal Manufacturing
& Technologies

P. O. Box 419159

Kansas City, Missouri

64141-6159

A prime contractor with the United States

Department of Energy under Contract Number

DE-ACO4-76-DP00613.

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Date: 4/29/99 Revision: 0

A. Parties

The project is a relationship between

| | |
|---|---|
| Honeywell FM&T | Britz-Heidbrink Inc., |
| 2000 E 95th Street | 1851 Oak Street, PO Box 1179 |
| PO Box 419159 | Wheatland, Wyoming, 82201-1179 |
| Kansas City, MO 64141-6159 | |

B. Background

Britz-Heidbrink Inc. (BHI) pioneered the idea that animal enclosures made from stainless steel rod and wire panels would be much more user- and animal-friendly if the bright reflective surface of the stainless steel was made less reflective or in fact coated with a black or dark colored paint. Medical research workers report that the animals are much easier to see and keep track of in enclosures where the stainless steel has been coated black. The animals also share the same optical benefit along with the fact that noise levels are reduced in coated enclosures as opposed to those not coated.

Initial successes by BHI with powder coatings were, however, followed by premature paint degradation, chipping, and peeling from the stainless steel wire. Since Federal Manufacturing & Technologies (FM&T) has considerable experience with paints and powder coatings and was in the process of exploring new types of paints and coatings that would benefit the manufacture of defense-related products, a CRADA was developed with the two companies as partners. Analysis of field failures on powder coated animal enclosures indicated two separate root causes for the failures. The paints were chipping

and peeling because insufficient cleaning had followed the welding together of the panels before painting. In addition, the powder coatings used initially were chemically incompatible with the aggressive disinfectant solutions used routinely to clean the cages.

## C. Description

The goal of this CRADA was to combine the powder coating material and application techniques and laboratory testing capabilities of FM&T with the manufacturing, real-world testing, and practical knowledge available to BHI in a limited study to determine if coated stainless steel would provide the durability needed to justify additional work in this area.

The coating materials chosen had to have low reflectivity and be easily sanitized, non-toxic, pleasant in appearance, and durable for the lifetime of the stainless steel product. The materials also had to be capable of withstanding the daily abuse of animal contact, impact with walls or other hard surfaces, and exposure to a variety of lighting and climatic conditions. FM&T and BHI worked together to investigate coating materials that under normal conditions would be exposed, at least weekly, to 180°F to 260°F washing and sanitization procedures that include strong detergents and phosphoric acid.

After a proper cleaning method for the bare panels was established, six different powder coatings were selected and tested. The coatings were selected for their known resistance to harsh chemicals. Sample panels of each coating passed 1000 hours of continuous salt fog exposure and 24-hour constant submersion in heated disinfectant solutions. Actual cage panels were then coated and installed in a high-pressure spray washer at a medical research facility for "accelerated" real-world testing. In the high-pressure spray washer, the panels received the equivalent of one year’s exposure to harsh chemicals in one week. In addition to the exposure to the harsh sanitizing chemicals, the test panels never had a chance to get completely dry. In actual use, the panels would have been cleaned once a week and would have been essentially dry the rest of the time. Constant soak in wet conditions is one of the most difficult tests of paint durability. The accelerated aging indicated that five of the six coatings tested are able to withstand the wear and tear of everyday use for extended periods of time, equivalent to 7-10 years.

## D. Expected Economic Impact

This project provided Britz-Heidbrink with a selection of suitable powder coatings from which to choose, each of which is capable of yielding a durable finish for their animal enclosures. Currently, BHI is recognized as a leader in innovative products for animal care equipment in North America. Internationally, BHI is beginning to obtain more recognition of its products due to the company's emphasis on cages and equipment that

provide environmental enrichment to enhance the psychological well being of the captive animal. There is a national and international customer base for the powder coated products. Until now the company could not rationalize the distribution of these products internationally because of the unreliable nature of the powder coated finishes they had previously tried. With the substantiated data as to the durability and life cycle of the finish from this project, the company can now begin to market and distribute more of its products in a powder coated form if they choose.

The cages and equipment, in an uncoated format, require extensive cleaning and sanitization to remove animal oils, urine, salts, and fecal matter. These materials adhere to the surfaces of the cages to such a degree that the cleaning process requires excessive use of heated water, acids, and detergents. The development of durable surface coatings that will not allow, to the same extent, adherence of animal waste, will reduce the amount of heated water and detergents required for the sanitization process. The reduction in heated water required will result in energy savings for the customer. The reduction in detergent needed or possible use of less hazardous detergents will yield a positive environmental impact.

E. Benefits to DOE

Since they are non-polluting, high-performance coatings, powder painting of various substrates, including stainless steels, is being considered for various DOE weapons systems. The effort to reduce air emissions from DOE as mandated by DOE and EPA regulations was directly aided by this CRADA. The DOE and FM&T also directly benefited from this project's testing of chemical-resistant powder coatings. Of the six powder coatings tested, four are already being used either directly on product or in a production support manner. These chemical-resistant coatings are being used in place of liquid-based paints that contribute to air emissions and waste disposal expenses. These dry powder coatings contain no solvents and create no hazardous waste. In some cases, traditional liquid-based coatings, which generate a certain amount of wet chemical hazardous waste, are being replaced by some of the coatings examined in this project.

Coating durability data is essential for informed selection and application of powder coatings to future DOE products. Since much of the testing in this project was essentially of the coatings themselves, data from this project will be directly applicable to DOE products that require paints or coatings, whether the substrate is stainless steel, aluminum, or other alloys. In particular, the SST and SGT Trailer projects are considering powder coated carbon steel instead of stainless steel but need more extensive durability data than is currently available.

This CRADA directly helped to develop and strengthen a new capability with the DOE, that of painting using powder coatings. Technical analysis of powder coated stainless steel is in line with the FM&T mission. As air emissions and waste streams from FM&T's production continue to be scrutinized with an eye toward reduction, new technologies such as powder coating instead of traditional liquid-based painting must be explored and tested. The lack of durability test results for powder coating has slowed the application of this promising new technology to DOE weapons production. Testing performed as part of this project supplied valuable data needed to advance the judicious use of powder coating within the entire DOE weapons complex. In addition, experience gained in this project with the actual testing methods will aid with future testing of paints for DOE applications.

F. Industry Area

Powder coatings are used in a wide variety of industries including automotive, aerospace, electronics, medical, and military. Durability data on powder coatings is always useful to those applying and using powder coatings whether the data is directly from their industry or not, just as the information collected on this project coating animal cages was beneficial to DOE's production of nuclear weapons.

G. Project Status

The project is completed.

H. Point of Contact for Project Information


Ken Bauer

US Department of Energy

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Fax (816) 997-2049

## I. Company Size and Point of Contact

Britz-Heidbrink Inc.,

Annual Sales in 1998: $2.1M

Number of Employees: 38

William E. Britz, Jr., DVM

President of BHI

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FAX 307-322-4141

Gail A. Heidbrink, LATG

Vice-President of BHI

Office 307-322-4040

FAX 307-322-4141

### J. Project Examples

Coated and tested test specimens and actual animal enclosure panels are available for examination along with photographs of problem areas on panels prior to cleaning and coating.

### K. Technology Commercialization

The process is being commercialized by the project partner, BHI.

## L. Release of Information

I have reviewed the attached Project Accomplishment Summary prepared by Honeywell FM&T and agree that the information about our CRADA may be released for external distribution.

Original signed by 12-20-99

Name: William E. Britz, Jr. DVM Date

Organization: Britz-Heidbrink Inc.

Title: CEO