WP-0801 – Ultraviolet Cure Powder Coatings

Ultraviolet cure powder coatings are the latest developments in powder coatings technologies. UV cure powders remove the “tether” to an oven, allowing application of powder coatings to large and complex objects unachievable in the past. To achieve the necessary corrosion resistance, these powders contain non-chromium corrosion inhibitors and can perform as well or better than wet-applied hexavalent chromium containing coatings. There are no HAPs or VOCs involved, and considerable savings are realized by the elimination of hazardous waste.

Disadvantages of wet paint systems:
• Resin and hardener for primers and topcoats must be precisely combined
• Cure times of 4-5 hours primer, and 12-72 hours topcoat per application
• Solvents are required for clean up (producing HAPs)
• Transfer efficiency is only 50-60%
• Requires hazardous waste management

Advantages of Ultraviolet Cure Powder Coating (UVCPC):
• Because the powder is melted with IR light, no oven is required
• Once powder is melted (in minutes), cure by UV light is complete in seconds
• Lower temperature operations (<190°F)
• Virtually no limit to size of object that can be coated
• Eliminates primer application, powder is formulated with corrosion inhibitors
• Eliminates environmental burden (HAP, VOC, and chromium free)
• Eliminates need for determining material quantities for each job application
• Eliminates hazardous waste (no solvents, made with non-hazardous materials)
• Improves transfer efficiency to nearly 95% (with reclaim)
• Significantly reduces annual operating costs (labor, materials, utilities, training, disposal)
UV Cure powder can be applied by virtually any of the standard application methods. For this phase of the project, the powder will be manually applied using a standard electrostatic Corona powder application gun.

Corona guns electrostatically charge the powder. Although one disadvantage to corona guns is the Faraday Cage effect, newer guns are able to overcome much of this effect by going to a pulse mode of charging or through adjustment of voltages.

Curing of the UV Cure powder will be accomplished by the use of a robotic curing system. The advantages of using robots are:

- Robots ensure repeatability
- Robots with UV sources can maintain extremely close target distances
- Robots can be re-programmed in seconds
- Robots eliminate need for many fixed UV cure lamps
- Robotic curing is well suited to large or complex parts
Demonstration Applications for UV Cure Powder

- EA-6B wheels, landing gear
- HH-65
- P-3 wheels, landing gear, radomes
- Mk-48 torpedo components
- HC-130 main landing gear doors
- KC-135 wing flap, refueling boom
- Submarine ice caps
- Submarine communications buoys
- Ammunition storage cases

**UV Cure Powder Major Milestones**

- Validation testing begins – December 2008
- Demonstration Plan submittal – June 2009
- Field Service Evaluation begins – March 2010
- Joint Test Report – January 2011
- Final Technical Report – April 2012

**UVCPC Points of Contact:**

- Mr. Corey Q. Bliss, Principal Investigator, AFRL/RXSSO, Wright Patterson AFB, OH, 937-255-0943, corey.bliss@wpafb.af.mil
- Christopher W. Geib, Co-Principal Investigator, SAIC, Beavercreek, OH, 937-431-4332, geibc@saic.com