Material Characteristic Study for Polymedia-Lite™ Blasting Media

Background:

The advent of the National Emission Standard for Hazardous Air Pollutants (NESHAP), and the concomitant requirements for minimal release of hazardous air pollutants (HAP), has compelled military and industry aircraft rework facilities to explore mechanical paint stripping technologies to replace traditional chemical strippers. Dry media blasting (DMB) has been widely accepted as a replacement technology, but there have been continuous concerns about the effects of the blasting process on the mechanical properties of thin skinned aluminum and the composite material structure. Two types of abrasive media, Type V Acrylic and Envirostrip™ Wheat Starch, have competed for acceptance as the blast media of choice. Type V Acrylic can quickly remove paint from a substrate, but it may induce undesirable stress states on the surface of an aluminum panel (as measured by Almen arc heights. Envirostrip™ may not induce as severe a residual stress rate, but has a slower coating removal rate, absorbs water, and has an unstable removal characteristic, i.e., the coating removal properties change while the media is being used.

A new polymer stripping media, Polymedia-Lite™, has been introduced to address the disadvantages of Type V Acrylic and Envirostrip™. Initial tests by the manufacturer indicated Polymedia-Lite™ performed at least as good as Envirostrip™ (a commercially available wheat starch based abrasive media) in terms of surface finish and residual stresses on the surface. Its performance characteristics are less sensitive to water than the wheat starch based media. In addition, the coating removal rate appears to be comparable to Type V plastic media abrasive.

Project Sponsor/Customer: Air Force wide
Period of Performance: 1995 -1996

Objective:

The objective of project was to investigate the effects of the Polymedia-Lite™ paint stripping media on the material characteristics of aluminum alloys common to aerospace vehicles and of thin aluminum substrates (a worst case condition). The

intent of this project is to establish optimum process parameters and to prepare the groundwork necessary to integrate Polymedia-Lite™ into the U. S. Air Force's paint stripping processes.

Status:

CTIO conducted an experimental test program to investigate the effects of Polymedia-Lite™ on this (0.0032 inch thick) 7075-T6 and 2024-T3 aluminum substrates. The testing will study the effects, if any, that Polymedia-Lite™ may have on the material properties of thin (0.032-inch thick) aluminum substrates. The mechanical property tests include static tensile tests, constant amplitude fatigue tests, and constant amplitude fatigue crack growth rate tests. In addition, material damage assessment tests were conducted. These tests included cladding erosion, surface profile roughness, and residual stress peak/saturation data development. In accordance with the draft Air Force Engineering Qualification Plan (EQP) for Coating/Paint Removal Techniques, all mechanical tests were conducted on a minimum of ten valid baseline and experimental specimens.

- Tensile test: Data indicated no degradation of material properties due to stripping with Polymedia-Lite™
- Fatigue test: Data indicates there was no statistically significant difference in the average fatigue lives from the Control to Blasted specimens for clad 7075-T6 and bare and clad 2024-T3, but there was statistically significant decrease in the average fatigue lives for bare 7075-T6
- Fatigue crack growth rates (FCGR): There was no engineering difference. There was a significant improvement in FCGR observed for clad 7075-T6 and bare and clad 2024-T3 when using Type V acrylic

The baseline data indicates Polymedia-Lite™ is an acceptable process for depainting thin aluminum substrates. Polymedia-Lite™ compares favorably with Type V Acrylic when evaluating the effects of the media on the mechanical properties of aluminum. Polymedia-Lite™ appears to be much less damaging to the cladding and surface roughness, and produces less residual stresses at the surface than Type V Acrylic.

Test Plan: Dated Mar 96
Final Report: Titled: “Material Characteristic Study for Polymedia-Lite™ Blasting Media”

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