Plastic Media Blasting—Controlling the Process

by Dan Dickey, Innovative Peening Systems (IPS)

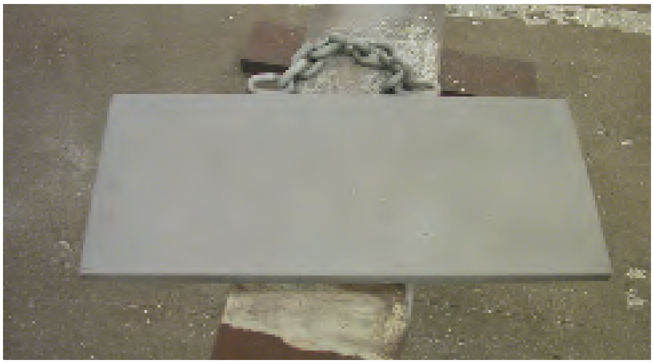
The most popular way to remove paint from an aircraft in the 1970's was to cover it with chemicals that would attack and swell the paint. The paint would then be removed by laborious methods such as rubbing and sanding. These methods created a hazardous stew of paint and toxic chemicals. Environmental regulations and the increased costs associated with handling and disposing of several thousand gallons of toxic waste for each aircraft became prohibitively time-consuming and expensive.

Another unrelated industry had a waste disposal challenge of a different nature. Button manufacturers were creating a waste by-product of buttonhole chads. I don't know who put buttonhole chads into a blast machine for aircraft paint stripping for the first time, but it certainly has evolved into a very large industry over the past 35 years. Button chads are no longer used as plastic blasting media but the media is still commonly made from a by-product of plastic items.

The uses for Plastic Media Blasting (PMB) are endless and more are being discovered every day. Traditional PMB is performed on coated flight surfaces such as airplane skins. Can you imagine using chemicals to strip the paint off of a C-5 military cargo plane or the delicate surfaces of the radar evasive B-2 bomber? The C-5 has 10,000 pounds of paint on the aircraft and the B-2 has many complex radar absorbing substrates. Economics dictate that a simple and effective method be used. Chemically stripping these aircraft is simply too expensive and environmentally unacceptable.

While PMB is cost-effective and environmentally-responsible, it's crucial to control the process so that it strips away tough paint and thermal-protection materials without damaging surfaces. Until recently, the PMB industry used subjective methods of inspecting the quality of the end result.

In 1994, Innovative Peening Systems built a state-of-the-art PMB facility for NASA at the Kennedy Space Center for stripping delicate space shuttle flight hardware such as the solid rocket boosters (SRB). The NASA paint-stripping operators developed a quality standard to establish the process with an aluminum coupon that was approximately two-foot-square and coated with a similar type of paint that was to be removed from the shuttle component. After machine setup, the operator would blast the coupon and then inspect it for surface roughness. If the blast stream was too aggressive, the coupon would exhibit severe surface roughness, indicating a dangerous blasting condition. The challenge now was how to quantify and control this degree of blast intensity.



As part of the quality control process, the PMB operators blast a two-foot-wide aluminum coupon that has been covered with a paint similar to the coating on the shuttle.

The Aero-Almen gage and aluminum strips provide a definitive measurement and quality control for the PMB process of the shuttles' solid rocket boosters.

Does this sound familiar, Almen strip users? Well, it did to me, too. With some help from Electronics Incorporated, IPS presented a unique version of Almen test equipment, called the Aero-Almen gage, to the NASA staff. This gage is used in a similar manner to an Almen gage but it uses an aluminum strip called an Aero-Almen strip developed for the U.S. Air Force. Because the aluminum strip is not magnetic, it has to be held into place by a special hold-down block with four spring loaded fingers.

After we realized that this was a better method of testing, we decided that the Almen strip method of intensity determination could be included with the original coupon visual inspection test. This would allow us to limit the maximum "peening" intensity as established by Aero-Almen arc height. Several coated aluminum coupons were then subjected to the blast. The blast pressure was then turned up for each test until the coupon showed signs of excessive etching and was determined to be a rejected coupon. The Aero Almen strips were then subjected to the same blast parameters and a measurement was made to determine the new maximum intensity and arc height acceptable on an Aero-Almen strip.

Strips are now blasted with every piece of flight hardware and a specific measurement and each strip is logged for that part—we have a permanent record of quality that will follow the flight hardware during its lifetime. The benefit of this new quality procedure was immediately apparent. The Aero-Almen strip, measured on a precision gage, provides a definitive measurement thus providing excellent process control capability.

The shuttle's rocket booster nozzle inside the Innovative Peening Systems' PMB enclosure.