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Removal of Conformal Coating with Small Sandblasters

The development of conformal coating technology was driven to a large degree by the military and aerospace industries. While conformal coatings are mostly used on populated printed wiring boards (PWBs), they are also used to protect components such as transistors, diodes, rectifiers, resistors, integrated circuits (ICs) and hybrid circuits including multi-chip modules (MCMs) and chip on board (COB).

Recent environmental regulations and concerns have had a significant impact on both coating materials and application methods, particularly with regard to control of volatile organic compounds and chlorofluorocarbon compounds. Both VOCs and CFCs have been extensively used as solvent carriers. Manufacturers and suppliers of conformal coating materials have responded by developing non-solvent based coatings and environmentally acceptable methods of application, curing and removal.

It is important to consider how the choice of a conformal coating material affects the rework and repair issues. The need for rework or repair of a conformal coating can occur any time after completion of an assembly due to a variety of process or product requirements and component replacement issues.

A number of methods are available for rework of conformal coatings. These include thermal, chemical, mechanical, plasma and laser-based systems, and small sandblasters or “micro abrasive blasters”, which will be the focus of this article.

Micro-abrasive blasters used for conformal coating removal are small sandblasting systems that are commonly used for metal deburring and etching and surface preparation. The cutting media is introduced into a compressed air stream and is ejected through a hand piece utilizing tips as small as .026”. This is directed at a component or surface area on PCB where the conformal coating has to be removed. This system can remove conformal coating from a single test node, an axial leaded component, a through-hole IC, a SMT component or an entire PCB without any modification to the system for a variety of coating materials. This method provides the most practical and environmentally friendly means for removing conformal coating from PWBs.

Although these small Micro Abrasive Blasters provide the most practical and environmentally friendly means for removal, they also pose a problem. Micro Abrasive Blasters can generate static electricity as the high velocity air and particles impinge on the PWB surface. The ESD voltage generated at the point of contact can cause damage to components and electrical circuits on a PWB.

Component ESD susceptibility ranges:

Type of Device	Voltage Range
VMOS	30-1.800
MOSFET	100-300
GaAsFET	100-300
EPROM	100
JFET	140-7000
SAW	150-500
OP-AMP	190-2500
CMOS	250-3000
SCHOTTKY DIODES	300-2500
RILM RESISTORS	300-2500
BIPOLAR TRANSISTORS	380-7000
ECL	500-1500
SCR	580-1000
SCHOTTKY TTL	1000-2500

Equipment manufacturers have used several different approaches to solving the ESD problem. These are:

- The installation of AC or DC pulsed ionizer bars in the chamber results in a rapid decay of ESD voltages in the work cell and tubing.
- The installation of a point ionizer at the end of the nozzle to dissipate any static charge built-up in the media stream at the point of contact.
- The use of an in-line, auto balanced ionizer where the air source is split, one side flowing to the media and the other side flowing to the in-line ionizer. This ionized air is then injected into the media stream just before it leaves the nozzle, eliminating the static charge build up in the media chamber. The ionized air is also pumped into the work chamber. With this type of system, ESD levels are reportedly in + 10 volts range.

Types of Cutting Media

- Sodium bicarbonate is a popular abrasive but it generates high ESD levels and it must be thoroughly cleaned off the PWA before reapplication of a coating.
- Aluminum oxide is a very aggressive abrasive which can damage PWB substrates. Typical ESD level range from 500-700 volts.
- Biological media such as wheat starch and walnut shells are not as aggressive as aluminum oxide and they usually leave a residue which must be cleaned prior to recoating and generate ESD.

There are several types of plastic cutting media available which have the lowest ESD levels and are recyclable.

Small sandblasters with the ESD feature can range in price from $2000 up to $15,000.