Application Information for CONATHANE® and CONAP® Conformal Coatings

This technical bulletin is designed to give the user suggestions to get the best results when using CONATHANE or CONAP conformal coatings for printed circuit applications. Application of CONATHANE or CONAP conformal coatings is very dependent on process controls by the user to gain the ultimate performance from the cured film. Several factors are involved in achieving this final high quality of performance

METHODS OF APPLICATION

SPRAY COATING

This is a practical and probably the most widely used method of applying conformal coatings. Most standard commercial air-pressure spray equipment is suitable for this type of application. However, each spray coating application is an individual situation and will require careful adjustments and control of application techniques. It may be necessary (and is highly recommended) that some type of air dryer and an oil trap be utilized on the compressed air lines to ensure delivery of clean, dry air to the spray head. Conformal coatings, in most instances, require slight dilution for spray applications. It is generally recommended that the mixture be diluted 10%-20% by weight with the solvent recommended for the coating that is being used. **Use the proper solvent** for optimum results. The amount of solvent needed for proper dilution may vary from one type of spray equipment to another and should be evaluated for best spraying characteristics with the particular spray equipment being utilized.

Several factors should be noted when spray coating:

1. The spraying operation should take place under an exhaust hood so that the fumes and fine mist are pulled away from the operator.

2. If the unit to be sprayed is highly compacted and/or has a high population of attached components, it may be necessary to spray apply the coating on several different planes to ensure complete coverage under the components.

3. If adequate coverage under the components is virtually impossible, it may be necessary to dip coat the unit with a highly diluted coating (50% or more) prior to spraying. The diluted viscosity of the coating should be low enough to prevent thick filleting and/or bridging of components.

DIP COATING

This is an effective method of applying conformal coatings to printed circuit boards that are not too bulky or irregular in shape. Using this method requires that the unit be immersed in a dip tank containing the conformal coating and withdrawn at a slow uniform rate.

In any dip coating application, two interdependent variables must be controlled to obtain desired results:

1. **VISCOSITY** - an increase in the viscosity of the material in the dip tank will increase the thickness of the resin film deposited.

2. **WITHDRAWAL RATE** - in most applications, a slow withdrawal rate will help produce a film of uniform thickness over the entire length of the board. A fast withdrawal rate will create drainage of the conformal coating that will cause a wedge-shaped film (thin at the top and thick at the bottom).

NOTE: The viscosity of the mixed system should be checked regularly and maintained at the value determined to be "ideal" for the intended application. The viscosity should be low enough to prevent thick fillets and bridging of the components. The viscosity of the mixed system can be adjusted by addition of the recommended solvent for the conformal coating being used. In any dipping application, the removal of excess drainage material is important. If this excess "bead" of conformal coating is left on the bottom of the coated board, it will blister badly when baked. This "bead" can best be removed by blotting off the excess coating on an absorbent material or by brushing it with an ordinary paintbrush.

BRUSH COATING

This method is mainly used to repair the coating film when a defective component has been removed from the board. It is generally not recommended for production use because of the relatively poor brushing qualities of conformal coatings (it is difficult to apply a uniform film thickness).

Whatever method of application is used, it is of the utmost importance that the conformal coatings be applied as uniformly as possible to eliminate thick fillets and bridging of components. For optimum performance, it is recommended that the cured coating

thickness be not be less than 1.0 mil nor greater than 4.0 mils. Generally, a 2.0 mil thickness (± 0.5 mils) will give the best protection against the environmental requirements of MIL-I-46058. Two coats of a conformal coating (approximately 2 mils thick) will provide adequate coverage on solder spikes. Thin uniform coats usually allow solvent to evaporate more readily, and the chance of bubbling in the coating is lowered. Coating films that are too heavy can retain solvents that may cause bubbling and lead to poor humidity resistance and/or eventual cracking of the film or fragile components. If severe humidity or environmental conditions are expected, coating thicknesses greater than 2.5 mils can be utilized, but under no circumstances should the coating thickness exceed 4.0 mils.

The most important factor involved in conformal coating is the cleanliness of the laminate or substrate being coated. This will ensure prevention of under-film corrosion and promote the adhesion of the cured film to the substrate and attached components. Remember, boards and components ***MUST BE CLEAN, OIL-FREE, AND DRY.***

SUGGESTED CLEANING PROCEDURE

1. **After wave solder or assembly, vapor degrease the assembled unit in acetone or other suitable degreasing solvent.**
2. **Clean in isopropyl alcohol conforming to TT-I-735. If necessary, scrub thoroughly with a stiff-bristled brush to remove flux residues. Use rubber gloves or finger cots to handle the edges of the board assembly to avoid further contamination.**
3. **Rinse thoroughly with clean isopropyl alcohol or other cleaning solvent.**
4. **Rinse thoroughly with de-ionized or distilled water under pressure or agitation.**
5. **Air dry printed circuit assemblies (PCA) for 15-30 minutes.**
6. **Oven dry PCAs for 2-3 hours at 60°C or 1-2 hours at 75°C.**
7. **Remove PCAs and allow them to stabilize at room temperature. PCAs should be coated as soon as possible after stabilizing at room temperature.**
8. **If inspection and/or re-work is required on the PCAs, and they are handled excessively, repeat vapor degreasing for 10-15 seconds or repeat steps 3-7 prior to coating.**

Again, we cannot stress enough the extreme importance of good cleaning methods before conformal coating. Good cleaning procedures at the outset will eliminate problems at the end of the process.

SUGGESTED CONDITIONS IN COATING AREA:
70°F-80°F @ 30%-50% relative humidity

> NOTE: Relative humidity should not exceed 65%. Temperature should not be less than 65°F or greater than 85°F.

See our ***Conformal Coatings Comparison Chart***.