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## Preform and Film Processing Guidelines

### **I. Introduction:**

There are two types of TechFilm® preforms and films, supported and unsupported. Supported films and preforms have a layer of reinforcement material in the adhesive. The typical reinforcement (support) types include woven and non-woven glass, non-woven carbon, Kapton® and PET. Most supported preforms can be made to a thickness between 3 and 7 mils. Thicker and thinner preforms as well as other types of support may be possible, consult with a TechFilm representative for your particular application. Supported preforms have the advantage of being much harder to distort when handled. They also have the advantage of including the properties of the support into the adhesive. For example, a high voltage application would utilize a Kapton support due to the high dielectric strength of Kapton.

Due to the manufacture process, unsupported preforms/films are more likely to distort when applied to a substrate. Therefore, the transfer method is recommended (see application methods, transfer).

### **II. Application Methods:**

A substantial contributor to a good bond is proper wetting of the substrate surface. At a minimum, substrates to be bonded should be free of contaminants such as fingerprints and oils. The best wetting can be achieved by substrate surface modification. For specific surface preparation methods see Technical Data Sheet 10005,

“Recommended Procedures for Cleaning Metal and Plastic Parts for Optimum Adhesion”.

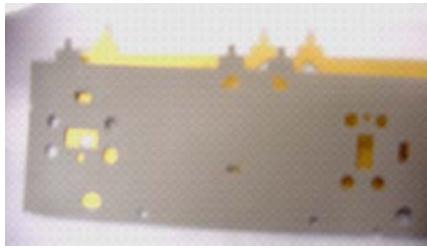
When using a preform or film, the material is usually applied to one of the surfaces to be bonded before assembly and final cure. There are three basic methods for applying films and preforms to surfaces: A) Transfer, B) Cold Release, C) Hand Placement Methods.

#### **A) Transfer Method:**

The transfer method is usually utilized for unsupported preforms. The following procedure describes the transfer procedure.

- 1) Remove the film from cold storage and allow it to warm to room temperature. If humidity levels are high it is advisable to allow it to warm to room temperature in a desiccator or other area of low humidity. After it has warmed to room temperature, if present, remove the release liner from one side of the preform.
- 2) Preheat the substrate to 70°C to 90°C.
- 3) Locate the preform onto the substrate; align by eye or use locating holes if provided on the release liner. Smooth out any trapped air by hand, use of a weight, or with roller or smoothing device (see Figure I). A heated laminator can be used for both the transfer and smoothing processes. Also see section III E Vacuum Bag Bonding.

**FIGURE I**



a) Align the part with preform



b) Transfer the preform to the part by applying heat and pressure.



c) Allow to cool and remove the release liner.

- 4) Cool the substrate to room temperature or less (the colder the better). A cold plate at 5 to 10°C is very efficient and works well. The release liner may then be removed by hand or by a burst of air.
- 5) Proceed to bond the mating substrate surface (see section III).

**B) Cold Release Method:**

Depending on the material the cold release method can be performed at room temperature or may have to be done at much colder temperatures 5°C to –40°C. The cold release method can be used with supported or unsupported parts and is usually used in conjunction with pick and place manufacturing methods. A brief description of the cold release method is as follows:

**FIGURE II**



- 1) Remove preforms from cold storage. Do not let come to room temperature.

- 2) While still cold, run the release liner over the edge of a corner (see Figure II). The parts will peel away from the release liner as they go over the corner. It is usually advantageous to specify the “highest release”, release liner available with this method.
- 3) Proceed to bond the mating substrate surface (see section III).

**C) Hand Placement Method:**

The hand placement method is self-explanatory. It is usually used in hand assembly processes with supported preforms. It can be described briefly as:

- 1) Supported, die cut, preforms are usually supplied with a release liner on each side. The first step is to thaw the preform from cold storage. However, it may be advantageous to peel a corner of the release liner away before completely thawed.
- 2) Remove one or both release liner(s) and place on the part. Remove the other release liner if not already removed.
- 3) Proceed to bond the mating substrate surface (see section III).

**III. Mating Substrates and Curing:**

After placing the two surfaces to be adhered together pressure should be applied to ensure good wetting. Because viscosity and temperature have an inverse log relationship the pressure applied will be affected greatly by temperature. Therefore the amount of pressure that needs to be applied is extremely dependent on process conditions. Furthermore, in biaxial flow, the

pressure needed is proportional to film thickness. Therefore, flow and wetting can also be controlled by film thickness (the thicker the material the more will flow at constant temperature and pressure). Pressures from 0.1 psi to 100 psi have been used successfully. Pressure can be applied in a number of methods among these are:

**A) Dead Weights:**

Weights are one of the best devices for applying pressure. Weights should be preheated to the cure temperature before use. An unheated weight will be a heat sink causing the bond to heat slower and less uniformly. If the substrates to be bonded are not rigid, a rigid plate should be used to assure even distribution of weight across the bonded area.

**B) Autoclave Bag Bonding:**

Autoclave bag bonding is probably the best device to use since any voids present in the bond line are collapsed or minimized by the application of pressure. Bonding with a dead weight or other pressure exerting method inside an autoclave will also reduce the size of voids.

**C) Spring Clips:**

Spring clips can provide a constant force during a cure cycle at low thermal mass. However, the force that they apply will deteriorate with time and use.

**D) Screw Clamps:**

Screw clamps should not be used since the force applied will decrease as the adhesive flows during cure.

**E) Vacuum Bag Bonding:**

Curing under vacuum is not advisable since ingredients in the adhesive may volatilize at low pressure and high temperature. Even if no volatilization occurs, air voids that are trapped will expand and remain in the bond area after curing. This is because all the surfaces may not be fully wetted by the adhesive, while the void is exposed to the vacuum.

However, a vacuum bag used in the application process of wetting the matting surfaces at 70 to 80°C is very helpful in producing void free bonds.

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**TechFilm Specifications:**

**General TechFilm Specifications are:**

**A) Screen Printed Preforms:**

For preforms < 0.003"thick  $\pm$  0.006" in the x, y plane and  $\pm$  0.0005" in thickness.

For preforms > 0.003"thick consult with TechFilm representative.

**B) Die cut Preforms:**

For preforms < 0.005"thick  $\pm$  0.010" in the x, y plane and  $\pm$  0.0005" in thickness

For preforms > 0.005"thick  $\pm$  0.010" in the x, y plane and  $\pm$  0.001" in thickness

**A) For Adhesive Sheets:**

For adhesive sheets < 0.005"thick  $\pm$  0.06" in the x, y plane and  $\pm$  0.0005" in thickness

For adhesive sheets > 0.005"thick  $\pm$  0.07" in the x, y plane and  $\pm$  0.001" in thickness

Consult your quote for actual specifications as they may change depending on preform.

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