

## Epoxy Film Processing Guidelines

Epoxy film adhesives are supplied as coated films on a release liner of heavy waxed paper or polyester. In many cases, there is a top release liner as well. In all cases, material is packaged in a sealed plastic bag to protect it from condensation during cold storage. This document outlines the recommended procedures, and the available options, for processing film adhesives. We are assuming that the material has already been cut to the required shape for the following process.

1. Remove packaged film from cold storage and let warm to room temperature before opening the sealed plastic bag. The goal is to enable thermal equilibrium with the environment before exposing the film so that there is no opportunity for condensation to occur on the adhesive, which could potentially reduce bond adhesion. In very humid environments it may be advisable to let the warming occur in a desiccator. Unused material may be repackaged into a sealed plastic bag and returned to cold storage. The objective is to protect the film adhesive from undesirable condensation.
2. Clean the materials to be bonded if necessary. The bonding surfaces should not have any particulate or chemical contamination on them. In particular, any lubricants, oils, or fingerprints should be removed with an appropriate solvent such as isopropyl alcohol.
3. Transfer film to a bonding surface with one of the following methods:
  - a. Pick and Place - Remove top release liner (if in place), separate film from the bottom release liner, and then place on the bonding substrate. Method of separation from the release liner will vary with the product, but either the film will be peeled from the liner or the liner peeled from the film. For very thin or flexible products stretching may occur and hot transfer would be the preferred technique. The second substrate is now placed on the adhesive.
  - b. Hot Transfer - Preheat the substrate to about 60°C, typically on a hot plate. After removing the top release liner, place the film on the substrate with the remaining release liner still in place. Press the film into the substrate with a hard rubber roller or other smoothing device. Remove entire assembly from heat and allow to cool back to room temperature. With this process the adhesive has partially melted and then tacked into place. When cool, the release liner can be pulled off. The second substrate can now be placed on the adhesive, and also tacked down at elevated temperature if desired.
4. Apply Pressure - With pressure applied, the assembly stays in position during the cure cycle and both good contact and wetting is assured. Most of the Resin Designs film adhesives work well with pressures in the 1 – 5 PSI range. Some assemblies may require up to 60 PSI. The optimum pressure depends on the materials being bonded, the choice of adhesive, the curing temperature cycle (especially ramp rate and peak temperature), and the degree of squeeze-out desired. Common methods are as follows:
  - a. Spring Loaded Fixtures - A wide variety of approaches are possible, from simple spring clamps to custom fixtures. Springs will lose effectiveness on multiple exposures to a cure cycle and should be replaced periodically.
  - b. Dead Weight - Use of gravity by simply placing a weight on the assembly can be effective, although the volume can be significant and the added thermal mass will increase the cure cycle time.
  - c. Laminating Press - Heated hydraulic laminating presses are widely used for

maintaining precise pressure and temperature control, especially with large area assemblies.

- d. Vacuum Bag - In this method, the assembled parts are placed in a temperature resistant plastic bag which is evacuated and sealed, effectively applying atmospheric pressure. The entire package is then placed in an oven to cure. This technique applies uniform pressure to the bond line, but it can lead to excess flow or squeeze out if there is trapped air at the interface.
  - e. Autoclave - An autoclave is a heated, pressurized chamber into which parts can be loaded either with a bag surrounding them or not. A bag is generally preferred for large parts, but with small parts it may not be necessary, especially if the surfaces are well pre-tacked to each other. An advantage of the autoclave is that it collapses any trapped air and minimizes flow from the bond line.
  - f. Screw Clamps - These are not recommended. Any clamp that is fixed and does not apply a “following pressure” as obtained with spring loading will produce a variable pressure during the cure cycle.
5. Apply Heat - In most cases, parts are cured by placing them in a pre-heated oven. The recommended cure time for any adhesive refers to the bond line temperature, and so the ramp time must be added to the total time in the oven. If there is any question, it is better to add time as a safety factor since there is no danger of over-curing.
  6. Cool and Disassemble Fixture - Parts are bonded.

These procedures cover 95% of the applications we have seen. Please contact us for any questions.

For additional information, product lists and technical data sheets:  
<http://www.assemblyanswers.com>.