

Heat Vacuum Application

AerFilm Contour[®] with Heat Activated Adhesive

Application Guide

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Heat Vacuum Application is a technique primarily used to apply decorative laminate to contoured panels. Heat Vacuum Application allows decorative laminates to stretch biaxially. All processing parameters need to be analyzed and optimized depending on the type of equipment used, operator and environmental conditions through experimentation.

Equipment Description

The Heat Vacuum Applicator (HVA) consists of the following parts:

1. A radiant heat source (provided by infrared bulbs).
2. A silicone rubber sheet mounted on a frame. (Optimal thickness approximately 60 mils or 1.5mm).
3. A vacuum source.
4. A support fixture—used to support the panel during the application of the decorative laminate.
5. OPTIONAL: Surge tank (used to provide a fast vacuum pressure)

Controls: Temperature Monitoring System

Vacuum Pressure Gauge

Panel Preparation

1. All damage to the panel should be repaired prior to starting the application process.
2. The substrate panel should be wiped down with a tack rag or isopropyl alcohol.
3. The back side of the decorative should be wiped with a tack rag to remove any dirt, grease, oil or other contaminants.

Procedure

1. The support fixture should be centrally positioned on the vacuum plate. It is typically constructed using a heat-resistant, two-component epoxy.
2. Vent holes must be drilled in all recess areas of the panel to ensure adequate vacuum pressure during the application process. Typically, a No. 72 (0.025") drill bit is used to provide adequate vacuum pressure, but not visible after application.
3. It is recommended that a primer adhesive be applied to all recesses on the panel. A common primer used is Bostik 7132 with Boscodur #24T curing additive. This adhesive can be thinned by using a solvent such as MEK to aid in the application, as well as shorten the drying time. It is important that the primer adhesive is completely dry prior to applying the decorative material. Please follow all manufacturer instructions when using a primer adhesive.
4. The panel should be placed in the support fixture.

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Procedure (cont.)

5. The decorative laminate is positioned over the panel, indexed and fastened to the support tool. The material should not be in contact with the panel so as to minimize the chance of wrinkling the material before it is hot enough to stretch. On some panels, it is possible to pre-tack the decorative to the perimeter of the panel.
6. The silicone rubber sheet is brought into position and locked, sealing it around the perimeter of the vacuum plate. An alternate method involves using the decorative laminate as the diaphragm, replacing the need for a silicone blanket. Typically, this method will allow for the material to be formed into recessed areas more easily versus the use of a silicone blanket. Using this method, the support mold contains a frame that holds the material along all edges and slightly above the panel surface.
7. The radiant heat source is started and positioned to pass heat through the silicone rubber blanket or decorative material.
8. Although many temperature measuring devices and methods are available, it is important to conduct experiments to ensure the actual glue line temperature is being measured throughout the application process. As the temperature reaches 140°F (60°C), gradually apply vacuum until a maximum of 12-inches (0.4 bars) of mercury is reached. A typical cycle is as follows:

**Depending on the contour and type of panel (composite or aluminum), the minimum amount of vacuum that will ensure contact of the decorative to the substrate and will yield an acceptable adhesion level without allowing the honeycomb core to telegraph should be used. Typically, only 8-10" Hg of vacuum pressure can be used on composite honeycomb panels.*

| TEMPERATURE | VACUUM |
|---|---|
| Ambient to 140°F (60°C) | 0 inches Hg (0 - bar) |
| 140°F to 203°F (60°C – 95°C) | 8 – 12-inch Mg (0.24 – 0.4 bar) & temperature |
| 203°- 212°F (95°-100°C) Dwell time 4 minutes | Composite Panels: 8 – 12-inch Mg (0.24 – 0.4 bar) Aluminum Panels: 8 – 12-inch Mg (0.24 – 0.4 bar) |
| 212°F to 104°F 100°C to 40°C) | 8 – 12 inch Mg (0.24 – 0.4 bar) |
| < 100°F (< 40°C) | Remove vacuum |

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Procedure (cont.)

10. Dwell Temperature is maintained between 203°- 212°F (95-100°C) for four minutes. (Ideally, the lower the temperature the better the texture retention and lower gloss level. To fully activate the adhesive, a minimum temperature of 194°F [90°C] should be achieved.)
11. The heat source is turned off, and the panel is allowed to cool down to <100°F (40°C).
12. The vacuum is turned off, and the silicone rubber frame is unlocked to remove the panel with the decorative laminate.
13. The laminate is wrapped around the edges of the panel and window openings and adhered with a heat gun. It is recommended to use a primer adhesive in all areas where the decorative material will be wrapped around the panel.

NOTE: Other sources of heat including a convection oven, quartz bulbs and cal rod heating elements have been successfully used in the application of AerFilm. A key feature on alternative equipment is temperature monitoring equipment.

Troubleshooting

1. Panels with recess areas require vent holes to be drilled. Make sure all vent holes are open to ensure maximum vacuum pressure. A No. 72 (0.0250" or 0.635mm) drill bit provides a hole which is large enough to evacuate air, but small enough not to telegraph through the decorative.
2. To ensure that the vacuum is uniform throughout the panel, the use of an open-cell foam or bleeder cloth between the support fixture and the part can be utilized.
3. To ensure a correct vacuum pressure reading, the vacuum gauge should be relatively close to the part. By having a vacuum gauge on the other side of the room, a false reading may be obtained.
4. To prevent the decorative from delaminating in deep-draw areas, the use of a primer applied on the part can provide additional strength. Care should be taken to ensure the primer is dried completely prior to application of the decorative. If the primer is not allowed to dry sufficiently, solvent blisters may result.
5. To ensure accurate temperature readings, the thermocouple should be attached to the back of the adhesive. The substrate should be of the same composition as the part to be covered.

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Troubleshooting (cont.)

6. To determine whether the material is forming in recess areas, tap the covered part with a pen or a coin. A hollow sound indicates the decorative has not been bonded to the substrate. Possible solutions:
 - 1) Check to make sure vent holes are open.
 - 2) Can a two-step operation be used?
 - a. Form material into flat areas
 - b. Insulate (shield) flat areas and continue heating and form into deep areas.
 - 3) Determine whether the blanket may be the restrictive element. If the blanket is the restrictive element, can the material be used as the blanket? Can a better forming material, such as a silicone blanket or polyvinyl alcohol, be used as the blanket?