

Converting Procedures for Vacuum Thermoforming of Translucent Series Film Applied to Rigid Plastic Substrates

Instructional Bulletin # 2.20 (Revision 2)

Dated: 12/31/14

1.0 Scope

This bulletin gives specific instructions for the vacuum thermoforming of translucent series films applied to rigid plastic sheet substrates.

2.0 Additional Instructional Bulletin References

- Instructional Bulletin # 4.01 - Application of Avery Dennison™ Translucent Pressure Sensitive Films to Avery Dennison™ Approved, Flexible-Faced Sinage Material
- Instructional Bulletin # 5.42 - Electrostatic-Printed Backlit Image Production

CAUTION: Due to normal variations in forming equipment, it is recommended that test faces be produced to confirm that Avery Dennison™ translucent films are usable with specific forming equipment and that the formed faces are acceptable for the intended use prior to the beginning of any project.

3.0 Safety Precautions

3.1 Ventilation

- Proper ventilation in and around the forming area must be provided to remove fumes which may be produced during the heating portion of the forming process.

3.2 Safety

- To ensure employee safety, it is recommended to consult with an Industrial Hygienist or specialist in the field of work environment safety to insure appropriate air flow and air recovery requirements for your specific operation. NOTE: Air flow directed to the heated sheeting will lower the forming temperature which may affect forming performance.

4.0 Process Precautions

4.1 Temperature

- Forming process temperature should not exceed 374° F (190° C).

4.2 Time

- Forming period should not exceed 10 minutes.

CAUTION: Overheating the Translucent Film may result in over exposure to harmful fumes, and may result in film degradation including film color change and possibly cause premature failure upon outdoor exposure.

Section 2 – Converting Information
Instructional Bulletin

Page 1 of 4



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- In order to prevent film overexposure to heat during the forming process, heat sensitive thermolabels can be used (Paper Thermolabel Co. Inc. 603-547-2034) to make temperature measurements on the surface of the film and plastic sheet, during the heating phase of the forming operation.
- For polycarbonate substrate sheeting, the use of double-sided heaters to heat both sides of the plastic sheet will result in the plastic sheet reaching proper forming temperature faster, and reduce the chance of overheating the pressure sensitive film.

4.3 Minimize Strain

- To minimize translucent film strain, it is recommended that the mold forms utilize a draft angle of 30° or less.

4.4 Minimize Stretch

- To minimize translucent film stretch, the depth of draw should be kept to a minimum, but not to exceed 3 inches (7.5 cm).

CAUTION: Exceeding the depth of draw will produce film thinning, color change of the film and may induce premature film failure in the field.

5.0 Substrate (Rigid Sheeting) Preparation

- If using the wet method to apply the Avery Dennison™ translucent film to the rigid sheeting, re-drying must be performed after each layer of film has been applied.
- Severe bubbling under the applied film may occur during the heating stage of the forming process if the substrate drying process is not properly performed.
- Rigid plastic sheeting to which Avery Dennison™ translucent film is applied must be properly prepared and dried as recommended by the sheeting manufacturer prior to the application.
- For a list of Avery Dennison™ recommended application fluids, please refer to Instructional Bulletin # 5.42 Section 2.0.
- Drying procedures will vary based on rigid sheet thickness used, please refer to rigid sheet manufacturer instructions.

5.1 Temperature

- It is recommended the film be applied when air and application surface temperature is in the range of 40° to 90° F (4° to 32° C).
- All surfaces must be considered contaminated and must be cleaned prior to application of film. See Instructional Bulletin #1.10 for substrate cleaning and preparation procedures.

5.2 Cleaning

- Wash surface with a mild detergent in water, then rinse with clean water.
- Wipe dry with lint free cloth prior to self drying.
- Saturate clean lint free paper towel with IPA and wipe small area. (1 sq. m).
- Dry the surface with lint free paper towel before the solvent evaporates.

Section 2 – Converting Information Instructional Bulletin

Page 2 of 4



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6.0 Translucent Film Application Notes

- Application of the Avery Dennison™ translucent film can be performed by either the wet method as detailed in Instructional Bulletin #5.42, or by a dry squeeze roll laminator.
- If using the wet method application, refer to the sheeting manufacturer's drying instructions.
- If the film was applied dry using a power laminator, allow the plastic with applied film to dwell for 4 hours (based on typical room temperature and humidity conditions) to permit the adhesive to flow out prior to forming.

7.0 Forming Molds

7.1 Mold Style

- Either male or female molds can be used to form faces using film.
- For first surface decorations, the plastic sheet with applied film must be formed using male molds, for second surface applications, female molds must be used. Depth of draw should be limited to 3 in. (7.5 cm) on returns and 0.75 in. (2.0 cm) on embossed or debossed copy. Copy should be cut to minimize the amount of film that is thinned during the formed process.

7.2 Mold Handling

- The film should never be trapped between the surface of the mold and the plastic sheet, which will result in severe disruption and distortion of the applied film.

8.0 Forming of Film Applied to Polycarbonate Sheet

8.1 Heaters

- The use of film on polycarbonate sheet for forming is restricted to double-sided heaters, where the heat input to the film side of the face can be controlled to minimize the heat exposure of the film.
- For polycarbonate substrate sheeting, the use of double-sided heaters to heat both sides of the plastic sheet will result in the plastic sheet reaching proper forming temperature faster, and reduce the chance of overheating the film.
- The sheet must be heated on both sides in double-sided ovens. The use of this type of heating permits rapid, uniform, controlled heating of both sides of the plastic sheet. By properly adjusting the heaters, it is possible reach proper forming sag without exceeding the 374° F(190° C) temperature limitation (use temperature tapes to ensure proper heating).
- Periodic testing to determine temperature level reached during the heating cycle is recommended to make sure film is not being overheated.
- Failure to adhere to these restrictions may result in overexposure to harmful fumes and poor film performance.

8.2 Sheet Thickness

- Forming of film applied to polycarbonate sheet is restricted to sheet thickness of 0.1 in. (2.5mm) or less. Greater thickness sheeting may require non suitable higher forming temperatures.

9.0 Forming of Film Applied to Acrylic Sheet

- Forming of film applied to acrylic sheet can be done with most existing vacuum forming equipment.

NOTE: Testing of the forming capabilities of your equipment prior to forming any faces is recommended to assure that the results are satisfactory to you and the end-user.

10.0 Cutting and Weeding

- The surface gloss of the rigid plastic sheet can be altered in the areas where translucent film has been exposed to the heat. After weeding, this may be unacceptable to some end users.
- Cutting and weeding should be completed as soon as possible after forming.
- Avoid the use of carbon paper and marking pens which may leave permanent marks on the film.
- Once faces have cooled to permit handling, copy and graphics may be cut and weeded from the applied film.
- Film cutting may be done with conventional "graphic" knives, using sharp blades. Use minimum pressure to avoid cutting or scoring the plastic sheet substrate.
- Patterns may be placed directly onto flat areas of panned faces, by pouncing, using chalk or carbon dust.
- For cutting around debossed or embossed copy, the film can be cut at any location, i.e. on the flat area of the letter, the beginning of the return, halfway into the return, etc., as required.
- Avoid over cut at corners of letters and graphics to eliminate or reduce light leaks. Any "over cuts" may continue to lengthen or expand, creating objectionable light leaks upon exposure. Use rounded corners whenever possible.
- Weeding may best be done by carefully holding a corner of the "weed" and removing it by pulling with sharp, short jerks between 110° and 160° angles (the angle at which the film is removed should be varied to minimize adhesive transfer).
- Whenever possible, pull the weed away from, rather than toward, the portion of film that is to remain on the surface. If adhesive transfers to the surface during removal, warming the surface slightly during removal will reduce the amount of transfer. Cutting the film to remove that portion of the film thinned during forming is recommended.

Revisions have been italicized.

Section 2 – Converting Information Instructional Bulletin

Page 4 of 4



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