Before Laminating – Ink, Media and Laminate Considerations

**Ink and Media** -- Most water-based inkjet inks contain glycol -- a benign, oily solvent. Glycol is found in particularly high levels in pigmented inks to help force the pigment particles through the inkjet nozzles and to prevent clogging in the ink lines. Glycol may also be used to slow ink evaporation allowing the inks to be absorbed into the media’s inkjet-receptive coating.

Excessive glycol is generally associated with creating most of the problems when using low-melt thermal laminates as it can reduce the effectiveness of the bond between the thermal lamination film and the print. Therefore, one way to prevent such bonding problems is to use the proper ink limiting setting for the specific media being laminated -- less ink, less glycol. This also has the additional benefit of reducing overall ink costs!

However, as heavy ink coverage is common and often required, ink limiting will get you only so far. And as inkjet prints dry by absorption rather than evaporation and different types of media absorb ink faster than others, both the amount of ink and the media used suggest the type of lamination film that should be used for best results.

**Laminates** - When laminating coated and/or non-resin coated papers with a matte finish, we suggest using low-melt thermal lamination films. These media types absorb ink readily and as such, an effective adhesive bond will be created between the media (print) and the thermal lamination film. For example, our highly absorbent Artisan GP Photo Velvet media combined with a thermal glossy laminate produces a finished image with lots of pop!

When laminating resin-coated photo base papers; backlit and polycarbonate films; and vinyl banner media, we recommend using pressure-sensitive laminates. The coatings on these media types do not absorb ink as readily and additional pressure is required to create an effective bond between the print and the pressure-sensitive lamination film.

**Laminating prints for outdoor use** -- We suggest using pressure-sensitive PVC laminates with UV inhibitors (e.g. our LPMF3 3mil Matte Lamination Film) instead of thermal laminates. Generally, thermal lamination films are made from polyester film, which allows water to permeates the laminate reducing its UV-resistant effectiveness. In addition, thermal laminates generally have UV inhibitors in the adhesive while pressure-sensitive laminates have UV inhibitors in the film, which provides a greater degree of UV protection.

**Cure the inks before laminating** -- Make sure that the inks have dried completely (cured) prior to laminating. If the printed image is still tacky to the touch, the print is not ready to be laminated as lamination adhesives have a hard time adhering to moist surfaces. One hour of dry time is a minimum but if there is time for a 24-hour dry time you will have the best performance.

Actual ink dry times will vary according to ambient temperature and humidity. Leaving a print to dry in a high humidity environment can have an adverse effect when laminating, as the print will absorb moisture from the air. Under these circumstances, we recommend using a hair dryer (heat gun) to apply heat to the back of the print to accelerate ink drying prior to laminating.
Laminating Parameters – Heat, Pressure and Speed

Heat -- When using pressure-sensitive laminates, we recommend applying heat to the top roller to activate and soften the laminate’s adhesive. When using low-melt thermal laminates, be careful not to apply too much heat as excessive heat can break down the laminate’s adhesive causing premature deactivation/failure. In addition, excessive heat can cause the inks to outgas (turn into a gas) at the temperatures shown below causing blistering and/or image damage:

<table>
<thead>
<tr>
<th>Ink</th>
<th>Temperature</th>
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<tbody>
<tr>
<td>Black ink</td>
<td>204°F/95.5°C</td>
</tr>
<tr>
<td>Cyan ink</td>
<td>200°F/93.3°C</td>
</tr>
<tr>
<td>Magenta ink</td>
<td>200°F/93.3°C</td>
</tr>
<tr>
<td>Yellow ink</td>
<td>195°F/90.6°C</td>
</tr>
</tbody>
</table>

Pressure - As a general rule of thumb, thick laminates require a lower pressure setting than thin laminates. For example, if using a 3mil pressure-sensitive laminate, run the laminator at approximately 80PSI. When using a 10mil pressure-sensitive laminate, run the laminator at approximately 50-60PSI.

General Operating Settings (also consult you Operator’s Manual)

<table>
<thead>
<tr>
<th></th>
<th>Pressure-Sensitive Laminates</th>
<th>Low-Melt Thermal Laminates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal Laminating Temperature</td>
<td>90-100°F(32-38°C)</td>
<td>175–194°F(79-90°C)</td>
</tr>
<tr>
<td>Laminating Speed</td>
<td>2-5ft./min. (0.6-1.5m/min.)</td>
<td>2-5ft./min. (0.6-1.5m/min.)</td>
</tr>
<tr>
<td>Pressure</td>
<td>40-80PSI(2.8-5.6kg/sq.cm)</td>
<td>60-80PSI(4.2-5.6kg/sq.cm)</td>
</tr>
</tbody>
</table>

Curing time – Once completed, allow the laminated print to lay flat for a minimum of 2 hours prior to rolling or trimming for proper adhesive curing. When possible allow the laminated print to cure for 24 hours -- especially important when laminating prints for outdoor use!

Laminating One Side Only – As opposed to both sides, it is common to laminate only one side of a print when using pressure-sensitive laminates or adhesive backers. For example, when creating trade show graphic panels using our reverse print FPCU10 PolyCarbonate Film mounted with our LPWB10 10mil White Vinyl Backer, for opacity and rigidity.

When laminating one side, we suggest using a sled to help ensure even pressure across the web. A sled can be anything with a rigid, hard surface such as acrylic or aluminum, although foam board is some times used. The advantage of using a hard surface sled is that you can apply a release liner to the sled, which prevents adhesive build-up and allows any remaining adhesive to be cleaned off efficiently.

Finishing and Transporting Laminated Prints

When cutting or trimming a laminated image, always cut the side with the thinner or softer material first using a freshly sharpened blade with a straight edge on tempered glass. For transport or storage, roll the laminated graphic with the thinner or softer side facing out with a resulting roll diameter no less than 12 inches. For example, in the case of the trade show graphic panel above, trim the “softer” LPWB10 vinyl backer side first. Furthermore, as the vinyl backer is more pliable than the FPCU10 polycarbonate film, roll the laminated panel up for transport/storage with the LPWB10 side facing out.
Common Laminating Problems

Hot spots on the rollers -- If the laminator is left idle and the rollers are not moving, the rollers will develop “hot spots”. This will create problems during lamination such as “silvering” and/or “out gassing”. If you need to keep your laminator at operating temperature when idle, keep the rollers moving in order to maintain even heat throughout the roller’s surface.

Silvering -- Occurs when the laminate’s adhesive is not fully activated due to a lack of heat – either the roller temperature is too low or the laminating speed is too fast (the laminate has not had sufficient time in contact with the heated rollers) -- resulting in a poor bond or wet-out of the adhesive to the print. To correct this, either increase the heat/pressure or reduce the laminating speed.

Coiling -- Occurs when the laminated media curls up on the edges due to a difference in tension between the printed media and the lamination film causing dimensional instability. This can be resolved by adjusting the following:

- Reduce upper laminators brake tension.
- Increase the lower brake tension.
- Reduce cooling on the top.
- Increase cooling on the bottom.
- Select a combination of media and laminates with similar physical properties.
- Reduce tension on the take-up reel to lessen the tension when the release liner is being pulled from the laminate.

Blistering -- Occurs primarily with thermal laminates generally due to excessive heat. The ink underneath the lamination film bubbles creating air pockets. This can be resolved by:

- Reducing heat.
- Increasing laminating speed.
- Using pressure sensitive laminates instead of thermal laminates.

Out gassing -- Occurs when excessive heat turns the inks into a gas. Out gassing can also be caused by an incompatibility between the laminate’s adhesive and the printed media or by not allowing the inks to fully dry (cure) prior to laminating. The results are typically a cloudy finished image or blistering (in the area of excessive heat). This can be resolved by:

- Reducing heat.
- Increasing laminating speed.
- Switching to a compatible media/laminate combination.
- Using pressure sensitive laminates instead of thermal laminates.

In feed Waves -- Bubbles or wrinkles in the laminated print generally caused by remaining moisture in the ink or uneven/insufficient tension across the web. This can be resolved by ensuring the inks are thoroughly dried (cured) before laminating and correcting tension.

Out feed “Boat” Wake – A “V” shaped ripple pattern on the lamination film formed as the laminated print is exiting the rollers. This is generally caused when too much tension is put on the “pull rollers”, which in turn causes the film to distort. Reducing the laminating speed and/or reducing the pull roller tension can resolve this.