

Decal applications may require an overlaminating film to provide protection for a graphic and extend its useful life. General Formulations provides many options for pressure sensitive clear overlaminating films. Each project can call for slightly different products depending upon finish, durability, and application. If you need assistance in selecting the correct overlaminate for your specific needs, contact your General Formulations customer service representative at 800-253-3664.

The most common and effective procedure to apply an overlaminating film to a graphic is the use of a dedicated laminator. Lamination is accomplished by running the graphic and laminate between two rolls under pressure. Laminators can vary in width up to 65 inches and some can accommodate rolls of laminate over 1,000 ft. in length. Thicknesses can be compensated for, by controlling speed and tension of the individual film rolls traveling through the laminator. The media chosen will determine the gap needed between the rollers or nip setting. The speed and tension (and on certain laminators the pressure) will need to be adjusted accordingly.

Lamination is a mechanical process and adjustments must be continually made depending upon what is transpiring with the lamination of the graphic. Most problems are a function of tension, pressure and speed of the laminating process. One common problem is trapping air between the graphic and laminate which can manifest itself as large visible bubbles in the worst case, to fine entrapment of air at the micro level, this is called "silvering". When large bubbles are present, it is often a function of tension and pressure and very visible. This makes the problem easier to observe and therefore can be corrected quickly. Silvering conversely is very fine and difficult to detect and can go undetected during a laminating run, because of the subtlety of the small bubbles. The remainder of this discussion will concentrate on the phenomenon of silvering and the means of control and prevention.

During the lamination process, the adhesive of the overlaminate must come into direct contact with the printed surface of the graphic. Total contact with the surface allows an unobstructed visual transmission of the color of the graphic through the overlaminate to the observers eyes. When a thin layer of air is trapped between the adhesive of the overlaminate and the printed surface of the graphic, two additional interfaces are induced that will disrupt visual transmission of the graphic to the observer. This disruption slightly scatters the light waves inducing a white appearance to the observer. This white disruption is easily observed against a dark background as a flecked or salt crystal form hence the term "silvering". Silvering can exist against a lighter colored background but there is no contrast to make it apparent to the observer.

Now that we know the technical cause of silvering, what means can be taken to reduce or prevent it?

FIRST OF ALL, WHAT TYPE OF GRAPHICS ARE MOST LIKELY TO INDUCE SILVERING?

Any graphic that has a rough surface is more likely to exhibit silvering than a smooth surface graphic. A rough surface can be as simple as ink on the media. When printing a large quantity of ink due to a graphic requiring high ink saturation, this roughness may occur. This is because some colors require more ink dots to achieve a particular color resulting in a rougher ink surface. All digital printers use a four color printing process. This means that any high ink density print has the potential to develop

silvering. For example: Four color screen prints have comparatively large ink dots so that process can also be particularly susceptible to silvering. To eliminate all micro air during lamination, the pressure sensitive adhesive has to penetrate all the valleys between the ink dots. In summary, the larger the ink dot or rougher the surface of the print, the harder it is for the adhesive to reach the valleys between ink dots resulting in air entrapment at the bottom of the valley.

WHAT MEASURES CAN BE TAKEN DURING THE LAMINATING PROCESS TO REDUCE SILVERING?

Temperature

A warm pressure sensitive adhesive will flow over a surface easier than when cold. Most laminators have a heated top roller to improve adhesive flow. When employing this method, moderation is the best practice. Using too much heat on a roll of laminate will induce shrinkage of certain films, inks may start outgassing, adhesive can breakdown, or induce sheet curl to the graphic's liner.

- Optimal heat for pressure sensitive laminates - 90 to 110° F.*
- Maximum heat for pressure sensitive laminates - 130° F.*
- Allow the laminator temperature to stabilize after temp adjustment before starting production. This may require 10 to 15 minutes.
- During warm up or cooling turn the laminating rolls for uniform roll temperature.

Pressure

As the name implies; a pressure sensitive adhesive will flow better as pressure increases. Most commercial laminators have hydraulic or air cylinders to apply pressure between the laminating rolls. Moderation is required.

- Optimal laminating pressure for pressure sensitive laminates - 40 to 80 PSI*
- A general rule of thumb: less pressure with thicker overlaminating films as opposed to thin films.

Tension and Speed

Tension and speed are interdependent in the laminating process. Air bubbles are an indicator of insufficient tension on the laminating film relative to the graphic. Silvering in a graphic means that fine amounts of air are getting trapped between the laminate and graphic so tension on the lamination film should be one of the first variables investigated. Another general rule is that as lamination speed increases tension will need to increase to maintain a flat lamination. Additionally, as laminating film thickness increases tension will need to increase to maintain a flat lamination. The goal in adjusting tension is to produce a flat lamination. An immediate curl off the laminator is a primary indicator tension is drastically unequal, one being too high relative to the other. Silvering in a flat lamination indicates tension is close to optimal, but pressure and speed should be adjusted. Slowing laminating speed will increase the time the adhesive has to flow under pressure and squeeze the last bit of air out of the valleys of a rough print, reducing silvering.

- Optimal laminating speed for pressure sensitive laminates - 2-5 Ft/ min.*

***These guidelines are general operating settings. Consult with your laminator manufacturer for specific recommendations.**

With the variety of print methods and the creativity of graphic designers, the printer/laminator will encounter an infinite combination of laminating possibilities. If a print has a rough surface finish and a predominate amount of dark or saturated ink coverage the odds are high silvering will show up when laminated. Fine amounts of silvering will dissipate from 24 to 48 hours after lamination as the pressure sensitive adhesive continues to wet out the print surface. It is good to be aware However, that ***moderate to heavy initial silvering*** will not usually be eliminated by adhesive wet out and may be cause for reprinting the job. Using these keys, the laminator operator must inspect the first laminated pieces for silvering. If detected, use the above measures to reduce and control the amount of silvering in the lamination. General Formulations uses specially formulated pressure sensitive adhesives and liners to create laminating films that flow easily to squeeze all the air out of a laminated print. These film properties give air an unobstructed exit from the laminating nip to produce the smoothest lamination possible. Depending on the roughness of the graphic, adjustments to the laminating process may be needed for each individual job to produce the smoothest silvering-free lamination.