Technical Paper Proposal for AIMCAL Fall Conference
Glatfelter - Engineered and Converting Papers Division

Title: Performance Liner for Digitally Printed PSA Films

Overview:

The choice of release liner can play an integral part in the success of a pressure sensitive adhesive laminate. In the case of vinyl or polyester films, the liner must act as the carrier for the laminate and allow for problem free converting of the adhesive coated synthetic facing. The design of the liner must take into account the adhesive coating process, converting of the finished master roll and feeding of the laminate through various types of printing and sign cutting equipment; as well as the initial silicone coating operation. Recent development of various types of digital printing technologies has added additional criteria to the liner. This paper addresses the various properties and requirements that are essential for the proper performance of a release liner for use in the graphics and signage marketplace, with a focus on the new emerging market of digitally printed films.

Background:

Liners for graphics and signage have evolved over the years into two primary categories; clay coated liners and polycoated kraft liners. Clay coated liners typically offer advantages from a cost standpoint, being more economical. Also, they are more stable for higher temperature converting and for some applications provide easier handling through winders, printers, and sign cutting equipment. Lighter weight clay coated liners, specifically 78# products, are used primarily for roll-to-roll converting. Heavier weights, such as 8 pt or 10 pt board stocks are used primarily for sheet fed applications, where additional stiffness and/or layflat are required.

Polycoated kraft liners, on the other hand, offer superior dimensional stability and layflat. They also provide a more consistent and uniform surface for silicone and adhesive coating, and offer better protection for the laminate under severe environmental or processing conditions.

The evolution of both of these liners can be further traced back to the development of the base paper used for manufacturing cast vinyl and reflective vinyl products for indoor and outdoor signage. The base paper required a smooth consistent surface, and sufficient tear and tensile properties to withstand the rigors of high temperature casting. Over the years the Graphics industry has settled on a small family of products that meet the manufacturing requirements for producing signage material.

Digital Printers:

The development of Digital Printing equipment has created an additional set of criteria for the release liners that are used. In addition to providing adequate adhesive release, and good layflat for problem free handling, the liner must now provide slip free feeding through the digital press. Also, the media used for digital printing is very susceptible to ink and/or silicone transfer. Any carryover from the backside of the liner of any contaminate, whether it be ink from a brand logo or silicone from release coating, will cause an unacceptable defect in the printing process. The liner has to provide some safeguards against this phenomenon.

Liner Construction – Rawstock:

The paper rawstock provides the strength and durability of the liner. The criteria used for the traditional 78# clay coated product and the traditional PCK type products, remain the same for the liner for digital printers.

Liner Construction – Basetock:

It is with the construction of the basestock where the biggest differences can be seen between the traditional 78# or PCK liners mentioned above, and the new liners for digital printers. As previously mentioned, the feeding of the laminate through the digital printing must be precise. Any slippage will cause an unacceptable defect. Therefore the liner must have a precisely treated backside surface to provide proper handling through the printer. Also, the coefficient of friction must be such so that the liner doesn't slip or misfeed.

This is one criterion for the backside coating. A second criterion is that the liner must be able to "accept and control" any contamination that could occur from prior converting processes. Often times with silicone coating there exists a small amount of silicone transfer from the silicone-coated side to the backside of the liner when rolled up in finished form. In most cases, the ink receptive layer on the media that is used for digital printing is very sensitive to any silicone contamination. If there is silicone transfer from the silicone layer to the backside of the liner, and subsequently from the backside of the liner to the media, this can cause defects in the print quality of the finished product. The appropriate treatment of the backside of the paper can prevent this from occurring.

Likewise, the backside of the liner is often printed for brand identification. This too can create issues with the finished product. If the ink is not completely handled by the backside coating, there is a chance that ink can transfer to the receptive layer of the media, creating a ghosting image on the print surface of the media.

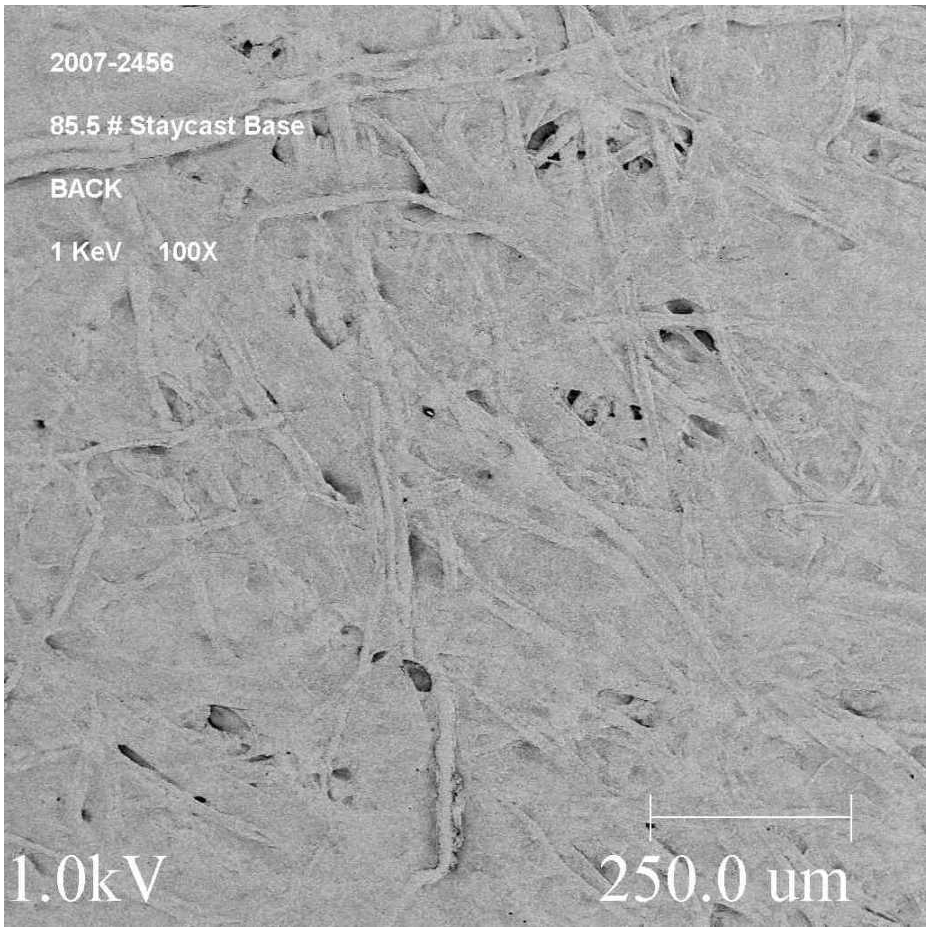
In order to achieve these properties, a proprietary clay coating was developed that would insure proper feeding, and eliminate silicone and ink transfer to the surface of the media.

Basestock - Verification of desired results:

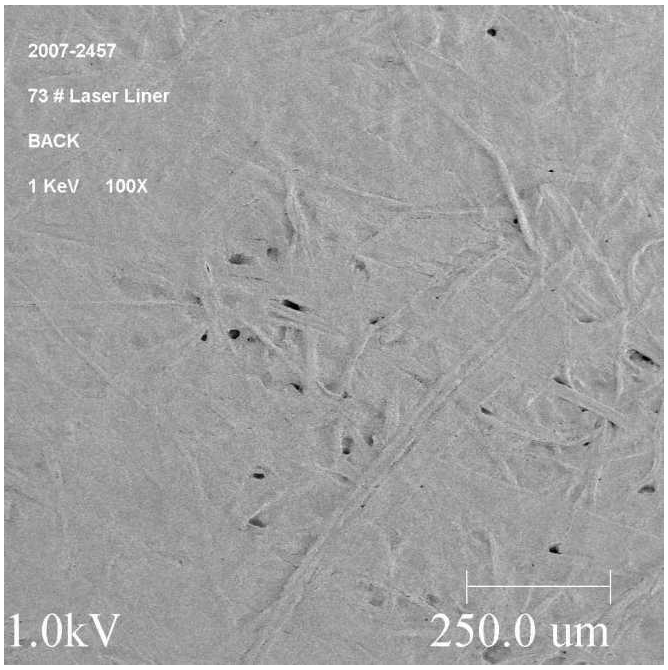
Visual inspection via high magnification photography was required in order to confirm that the application of the coating was applied in a consistent and uniform manner. Also, a test procedure that was suitable for a production environment was employed to insure that the desired liner attributes were consistent with each production run and that the proprietary clay coating was performing as designed. The SEM and Dyed Oil photographs below illustrate the difference between the Digital liner with its proprietary backside coating, and two typical 78# liners, one a traditional clay coated and calendered construction, and the other a "modified" version that is clay coated but not calendered.

Scanning electron microscopy, or SEM, photography is one method that is available to visually inspect the surface of the backside of the liner. Through the use of SEM photographs, it is possible to see if there is adequate and consistent coverage of the clay coating.

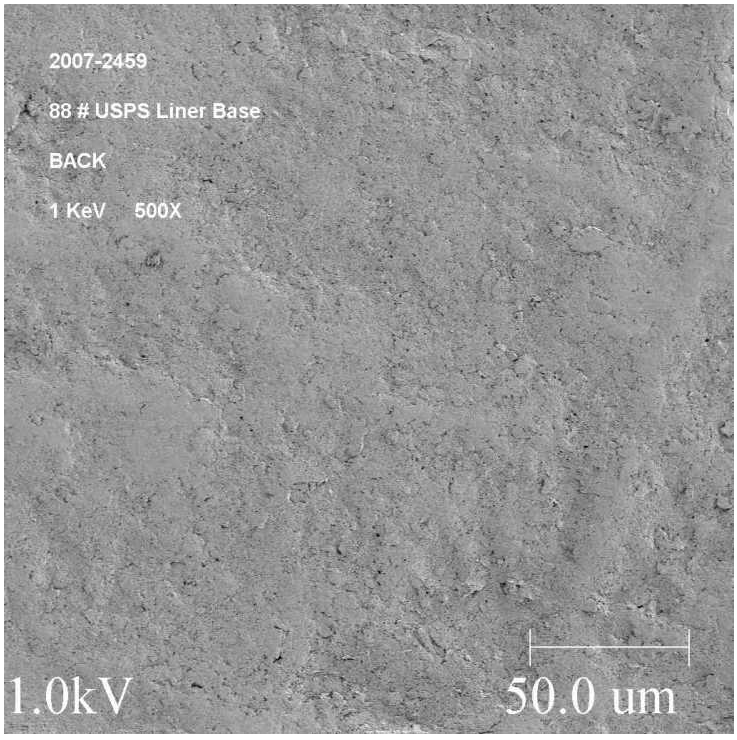
Picture 1.
Traditional 78# Liner – Backside



Picture 2.
Modified 78# Liner – Backside



Picture 3.
Digital Liner – Backside

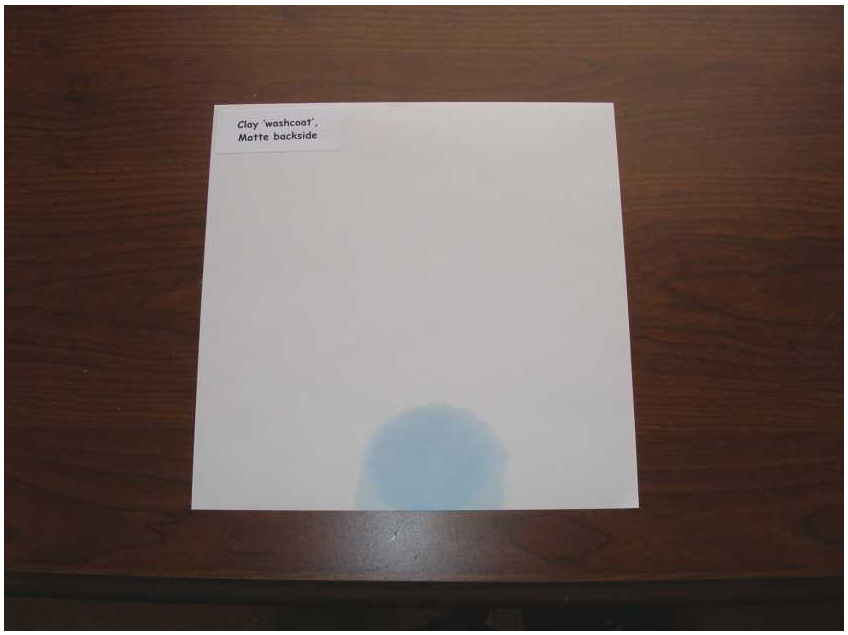


The SEM photographs show an inconsistent surface for both the Modified 78# liner, and the traditional 78# liner. Both Pictures 1. and 2. show a coating that does not completely cover the fibers and has areas of no coverage. Picture 3., on the other hand is of the Digital liner. This SEM photograph shows complete coverage of the paper fibers and a uniform coated surface.

Dyed oil penetration testing was chosen as the manner to insure consistent run-to-run performance. Using a controlled viscosity oil, it was possible to characterize the performance of the backside coating by establishing visual standards that represent the desired properties of the coating. A uniform coating would provide a uniform penetration of the dye. Also the density of the color should be uniform in all areas, representing consistent coverage and absorption across the paper web. Picture 4. and Picture 5. of the 78# liner and the modified 78# respectively, both show a surface that has non-uniform absorption of the dyed oil. There are areas where the oil is easily absorbed and areas where the oil does not absorb as well. The areas where the oil is not absorbed would represent possible sites for silicone transfer or ink transfer to the digital film surface. Picture 6. of the Digital liner, on the other hand, shows very consistent and uniform absorption of the dyed oil.

Picture 4.
78# Liner Dyed Oil – Backside

Picture 5.
Modified 78# Liner Dyed Oil – Backside



Picture 6.
Digital Liner Dyed Oil – Backside

Liner construction – Silicone:

The silicone-coating portion for this particular liner product does not vary significantly from traditional 78# liners or PCK liners used in other signage products. The options are for solventless silicone, solvent silicone, emulsion silicone or UV silicone. The requirements are for a medium – easy release that allows for easy weeding for letter cutting, without pre-releasing of the finished product. Many of these products are used with masking materials for transfer onto the finished surface in the same fashion as other traditional graphic materials.

Complete construction:

The finished liner is a product similar to a traditional 78# liner, with the added benefit of a treated backside surface that allows for problem free converting through digital printers. A proprietary coating was developed that provides good layflat properties, precise feeding through the printer, and handles any contamination that could occur from the silicone coating process or the brand logo printing. Future work will focus on optimizing the performance of the liner, and in incorporating any additional demands that might result from future developments in the printing and converting technology.

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