



### ***Improving Production Efficiency with Optimal Release Liners***

As manufacturers seek to reduce costs and increase productivity to succeed in the increasingly competitive global marketplace, one area that should not be overlooked is the release liner of pressure-sensitive adhesives (PSAs). The release liner is a throwaway component, yet it plays a critical role in PSA systems and must be specifically designed to perform well in the particular production processes to which it will be subjected. A properly designed release liner will function reliably in high-speed and automated processes, enabling significant gains in manufacturing productivity.

#### ***Prevalence of Pressure-Sensitive Adhesives***

Understanding the role of release liners is important because pressure-sensitive adhesives are becoming increasingly prevalent in a wide variety of manufactured products, from small portable electronic devices to the assembly of automobiles and aircraft, and from medical devices to windows and doors and other building products.

PSAs have several advantages compared to mechanical fasteners and liquid adhesives. Unlike mechanical fastening, PSA films, tapes, foils and foams can not only bond joints, but also dampen vibration and shock, reduce noise, fill gaps, and act as gaskets and seals. Pressure-sensitive adhesives do not require drilling or welding, and therefore, they leave surfaces smooth and free of blemishes. PSAs also eliminate the potential for galvanic corrosion that occurs when dissimilar metallic materials are coupled and exposed to moisture.

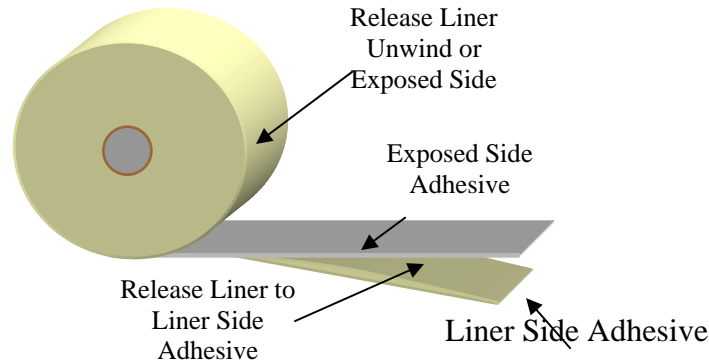
Moreover, by uniformly distributing stress over the entire bonded area, pressure-sensitive adhesives avoid the concentrated stress areas that can cause structural failure with mechanical fasteners. PSAs also allow the joining of both thinner substrate materials and materials that have different coefficients of thermal expansion.

#### ***Outsourcing with PSAs***

PSAs provide a pre-packaged, ready-to-use solution that allows manufacturers to essentially outsource the creation of the adhesive system to companies that specialize in this process.

The alternative is the in-house application adhesive types, such as hot-melt, spray, liquid, epoxy, and cyanoacrylate adhesives, on the production floor. These methods are difficult to achieve consistent performance. Application of liquid or spray adhesives requires constant user attention to systems, methods, quality inspection, as well as special expertise.

Many adhesives utilize solvents that emit volatile organic compounds that pose significant safety and environmental concerns. For these reasons, it is not surprising that manufacturers increasingly prefer to utilize pre-packaged pressure-sensitive adhesive tape systems created by companies that have expertise in this area and capabilities to engineer and produce adhesive tape systems in a controlled and safe environment.



### ***Functions of the Release Liner***

In a pressure-sensitive adhesive tape system, the release liner serves several important functions. During the manufacture of the PSA system, the liner provides a surface for a release system such as silicone, and it supports the adhesive through the curing process.

PSA's can be manufactured as either a one side or "single coated" product like those used in packaging tapes most often made with no release liner termed "self wound", or they can be made as "double coated" adhesives with one or two different adhesives coated either side of "carrier" such as a foam or plastic film. Double coated adhesive tapes may bond two dissimilar surfaces together as an automobile car door neoprene weatherstrip bonded to painted steel.

The liner also protects the adhesive during transport and storage, and during various converting and assembly processes, ensuring that the web remains intact. For die cut operations, the liner functions as an anvil for the cutting blades, holding the finished cut piece, while allowing for the removal of waste material. The liner also provides the layflat characteristics that prevent curling, an important attribute in graphics and other applications.

In some applications, liners are removed during the fabricator converting and assembly procedures; in other applications, a liner remains intact until removed by an end-user. The liner must satisfy the end-users performance and appearance requirements, despite whatever stresses it endured earlier in the process.

### ***Contradictory Demands (or Push Me, Pull Me)***

The multi-step process can present significant challenges in the design of a release liner, because different steps can present contradictory demands and a pressure-sensitive adhesive system.

Take, for example, an unsupported transfer tape (adhesive cast onto a release liner with no web or carrier) in an application to a fragile foam, such as melamine. In order for the product to be unwound from the roll, the release on one side of the liner must be less than that on the other. The release must be sufficiently low enough to allow the roll to be unwound and, at the same time, have high enough “backing release” to the remaining liner to hold the adhesive in place for processing. Too low a backing release or too high a exposed side release will cause “confusion,” meaning the adhesive may alternately stick to one side of the paper or the other.

Fragile materials, like the melamine foam, can be damaged by too high a backing release once the foam and adhesive have been laminated, making final liner removable difficult if not impossible without damaging the foam.

Therefore, in order to produce an optimal PSA for such an application, the tape system must balance the liner release requirements on each side of the liner based on the adhesive characteristics of the selected materials as well as processing environments.

To produce an optimal pressure-sensitive adhesive system for such an application, the adhesive company must achieve a balance between the requirements of step one and step two.

### ***Challenges of Kiss-Cuts***

Die cutting can also present contradictory requirements for release liners. Take the example of a Kiss-Cut, in which the die strike depth is precisely controlled down to the release liner but not through it. The usable material is left attached to the release liner, but the waste or “matrix” is removed.

For such applications, it is necessary to have a relatively low release (and high tensile strength) to ensure that the usable material adheres to the liner, but the release must be high enough to enable the removal of the matrix. Achieving this balance can be especially difficult for Kiss-Cuts of small objects and intricate shapes.

### ***Design Process for a PSA System***

Designing an optimal pressure-sensitive adhesive system requires close collaboration between the PSA vendor and the fabricator-converter or manufacturer utilizing the system.

First, it is necessary to understand the attributes of the substrates and the end-user requirements of the adhesive system, including the environmental conditions and the performance specifications that the adhesive must meet during its ultimate usages.

Accordingly, the appropriate adhesive will be selected for each substrate (e.g., rubber, acrylic or silicone adhesive).

Then, working back from the end-user requirements, the PSA vendor must understand the entire production process, including the sequence of processes, the force and speed of each operation, and the environmental conditions. The PSA vendor can then design a release system that matches the adhesives and performs reliably during the production processes.

### ***Types of Release Liner***

A number of different silicone coated materials are used for release liners, ranging from paper liners to plastic films. Densified Kraft paper represents an economical option, suited for general purpose applications and rotary die cutting, but not for kiss cutting.

Polycoated liners, consisting of paper with both sides coated with polyethylene, is one of the most versatile options. It is resistant to tearing and to wrinkling or “cockling” when exposed to moisture and humidity. Polycoated liners can be used for all forms of die cutting.

Board liners are made of paper with a heavy weight and a caliper (width) of 12-14 mils. The large caliper maximizes kiss cutting performance and allows easy removal of small parts and waste pieces.

Plastic films, constructed of polyester, PET and other polymers, offer excellent tear resistance and enable high speed rotary die cutting and hot wire cutting. Plastic films can produce dangerous levels of static electricity, requiring that mitigation measures be employed in dry climates and during winter seasons.

### ***Maximizing Productivity***

The optimal selection of a release system can have a dramatic impact on the overall productivity of end users and fabricator converting and manufacturing. Pressure-sensitive adhesive systems need to be designed not only to achieve excellent end-use performance, but also to maximize the speed, efficiency and reliability of the various intermediate uses on the production line.

Too often, poorly-designed PSA systems cause expensive production downtime when the release liner fails to protect the adhesive web or when the liner releases prematurely. Productivity is also greatly diminished when machines are set to slower speeds because of the poor performance and lack of reliability of release liners.

By working closely with the converters and manufacturers, pressure-sensitive adhesive vendors can enhance production speed and quality by designing release liners to meet the specific needs of the end user and the fabricator.

## **About Adchem Corporation**

Adchem, an ISO 9001 certified and A2LA accredited company, manufactures an innovative line of pressure-sensitive adhesive tape systems, including double-coated papers, films, tissues, foams and fabrics; transfer tapes; one-side coated products and other custom-coated specialty products. Our 100% solids adhesives, solvent and water based acrylics and rubber adhesives are used in a variety of industries, including automotive, construction, electronics, graphic arts, medical and general industrial tape applications.

For additional information and samples, please contact Adchem Corporation, 1852 Old Country Road, Riverhead, NY 11901 Phone: (631) 727-6000 Fax: (631) 727-6010 or our website at [www.adchem.com](http://www.adchem.com) .