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The Adherent®

Technology Insights from Adhesives Research

Insight

Taking your products further.℠

Die-Cut Friendly Pressure-Sensitive Adhesives Improve Manufacturing Efficiency

Pressure-sensitive adhesives (PSA) are often a favorable material choice in device assembly applications because their continuous roll format offers a wide range of conversion options and manufacturing efficiencies when compared to liquid adhesives. During conversion, PSA rolls can be processed in a number of ways, including: high-speed laminating, slitting, sheeting and guillotining; also laser, rotary, or flatbed die-cutting to meet the needs of the end application.

Although the PSA format offers many manufacturing efficiency benefits for high-speed conversion, the adhesives' viscoelastic characteristics can occasionally present challenges, if not well-matched for the application. For example, if the adhesive is too hard, the tape will provide clean cuts, but less than optimal bonds for laminating. Whereas, if the adhesive is too soft, it will laminate well to other component parts, but the residue may also adhere to machinery blades during conversion, affecting the precision of individually cut parts. When residual adhesive builds up on cutting blades, the result can be increased cutting cycle time, and downtime for cleaning, reducing overall conversion throughput.

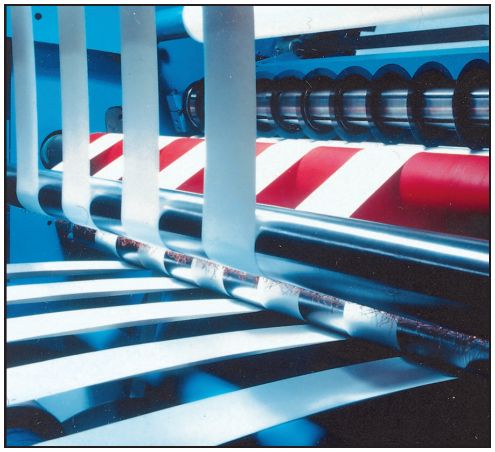
Avoiding a Sticky Situation

Adhesive build-up during conversion is often a concern in conversion processes for medical in-vitro diagnostic (IVD) and environmental testing devices that rely on very small microfluidic capillary channels for transporting a sample fluid to the testing zone within the device. An unclean cut can create adhesive blockages in these delicate channels. It is also critical that the die-cutting process does not cause the adhesive to string over the capillary. Any adhesive blocking will retard the capillary's ability to fill, and in turn compromise performance of the final device.

Other examples can be seen in the electronics industry. As electronic devices become smaller and thinner, electrically conductive PSAs are often utilized for electrical interconnects. Die-cutting these components from PSA rolls afford electronics manufacturers a precise component, however, unclean cuts or adhesive migration could potentially cause interference with the device's other sensitive components.

A Formulation Balancing Act

Die-cutting performance of an adhesive is dependent upon the adhesive's physical properties. The adhesive attributes related to die-cutting include the viscoelastic profile and glass transition temperature (Tg). In considering an adhesive's viscoelastic properties in relation to die-cutting performance, evaluating how the viscoelastic properties change when increasing frequency or shear rate can provide an indication as to how



efficiently an adhesive will die-cut. In the case of double-faced spacer tapes used in diagnostic test strips, it is the interaction of the adhesive, substrate and bonded layers that ultimately determine die-cutting performance.

At Adhesives Research, we address applications requiring the cleanest die-cuts by specifically formulating PSAs to perform more like solids and less like liquids. We then carefully validate each adhesive's viscoelastic properties through sophisticated analytical techniques to assure optimum performance in high-sheer, high-speed conversion processes. Today, we offer a range of die-cut friendly product formulations including single- and double-faced tapes, transfer adhesives, heat-activated and non-tacky hydrophilic-coated films.

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