

Fundamental Practices for Achieving Good Adhesion of PSA's

There are many differences between acrylic and rubber based pressure sensitive adhesives. Part of achieving a good bond is selecting the correct adhesive or adhesive construction to permit the maximum possible adhesion. At times, compromises will be necessary to obtain the best overall balanced performance in a specific application.

Generally speaking, rubber adhesives will provide the highest adhesion to the widest variety of substrates. Because of their aggressive nature, excellent bonds are relatively easy to achieve. However, due to their limited temperature, chemical and U.V. exposure resistance, they cannot always be used.

Most high performance acrylic adhesives are relatively firm and not as aggressive as their rubber counterparts. Their ultimate adhesion is typically not as high and as a result; the best bonding practices should be used to achieve their maximum potential. Acrylic adhesives also have more difficulty bonding to low energy surfaces such as polyethylene and polypropylene. However excellent U.V., chemical and temperature resistance along with superior durability often dictate their selection.

Surface Preparation:

In order for the adhesive to contact the surface, the substrate must be dry and free of any surface contaminants. Dust and other loose particles can be wiped off with a clean cloth, blown off with an air-jet, or removed with a tack cloth. Sometimes it may be necessary to remove loosely bonded coatings (i.e., paint) by scraping or with an abrasive such as sandpaper or steel wool.

For contaminants such as oils, waxes, silicone and similar lubricating or processing materials, cleaning with a mild solvent such as heptane, hexane, toluene or a chlorinated solvent may be necessary. Caution should always be exercised due to their flammability and potential toxicity. Always use clean cloths that are replaced frequently so as to remove the contaminant from the surface rather than simply spreading it around with a soiled cloth.

Surface Contact:

The elementary concept of adhesion involves getting the adhesive in contact with the substrate. The more complete the contact, the better the bond. Once surface contaminants have been removed (see above) and the correct adhesive/adhesive construction has been selected, the actual bonding process can begin. There are often three surface conditions that must be addressed:

Rough or Irregular Surfaces

1. The proper adhesive product construction must be selected to maximize the potential contact of the adhesive and the surface. Using enough adhesive (correct thickness) to permit the adhesive to flow into the valleys or crevices is very important.

2. Enough pressure must be used during bonding to force the adhesive into the valleys. The amount of pressure required can vary with the firmness of the adhesive and the depth of the valleys. Often this must be determined through trial and error.
3. The application of heat during bonding can be used to soften the adhesive and allow it to more readily flow into the valleys. The actual temperature to use will be dependent on the particular adhesive as well as other processing conditions. Firm pressure should be used with the heat.

Miss-matched or non-parallel Surfaces

1. Often a thicker adhesive product construction is required to bond these type surfaces. Foam tapes of varying thickness can be used to fill the gap and compensate for the miss-matched surfaces.
2. If the miss-match is relatively small, thick transfer tapes can be used.
3. Very firm pressure is required so that the adhesive product can be deformed to match the unevenness of these surfaces thus permitting more complete contact.
4. Achieving intimate contact of the adhesive on these surfaces during bonding is imperative since there is often a spring-back or separation effect immediately after removal of pressure due to the miss-matched configuration of the substrates.

Smooth Uniform Surfaces

1. A clean, smooth, uniform surface is much easier to bond. The wet-out or contact of the adhesive on the substrate surface is usually more complete without having to resort to excessive pressure or heat.
2. Although the surface appears to be perfectly smooth, there is always a degree of roughness that may not be visible to the naked eye. The use of good, firm pressure will help insure maximum initial contact with the surface and the maximum initial adhesion. However, with the passage of time, the adhesive will flow (coldflow) on its own into the minute surface irregularities and approach 100% contact thus insuring the maximum potential bond. Typically, 24 to 48 hours of dwell time will allow the adhesive to obtain 95+% of its potential. Some very firm adhesives may require up to 72 hours or longer.
3. One of the greatest concerns with pressure sensitive adhesives is that complete contact is not achieved due to entrapped air during the bonding process. For that reason, a lamination process that uses a laminating roll to chase out the air as the bond is made is advisable.
4. Typically, pressures of 15 to 25 lbs per inch width of bond line are used. Higher pressures are of benefit provided the pressure will not damage the substrate.

Storage recommendations:

- Store pressure sensitive adhesive stock on a flat surface in a cool dry area and avoid stacks of material greater than 24 inches (2 feet) high. Never store directly on a concrete floor.
- Avoid extreme temperatures and high humidity. 72⁰F and 50% humidity are recommended.
- Rotate stock regularly when new product arrives.
- Do not open sealed packages until ready to consume.
- Return unused stock to the carton or protected packaging when not in use.