

6 Factors to Choosing the Right Adhesive Tape

The choice of an adhesive is based upon the use of the tape and the environment in which it is applied and used. The following elements are crucial in determining the correct adhesive selection. As with all pressure sensitive applications, testing is recommended before finalizing a decision. In choosing the right tape for the job, follow these guidelines to increase the likelihood of success:

1. Determine the Type of Materials

- a. **Question:** Will the tape be placed on metal, plastic, cardboard or other?
- b. **Surface Energy:** Knowing the surface energy of a material, helps determine the best adhesion. Surface energy ranges from high to low, and is measured by how well an adhesive wets out over the surface of the material to which it is applied. As a rule of thumb, the higher the surface energy, the greater the strength of the adhesion. Materials with low surface energy (LSE) do not allow adhesives to wet out, while materials with high surface energy (HSE) provide excellent wet-out, providing the best adhesion. Rubber-based adhesives usually provide a better adhesion to LSE surfaces. Specially formulated adhesives are available for LSE surfaces and some substrates require special treatment such as corona treating, primers, top coating in order to achieve better adhesion. On some LSE substrates, adhesion levels improve the longer adhesive is applied.

HIGH		MEDIUM		LOW
400-1000 dynes/cm	42-50 dynes/cm	38-39 dynes/cm	36-37 dynes/cm	19-33 dynes/cm
Aluminum	Kapton®	ABS	PVA	EVA
Stainless Steel	Phenolic	Polycarbonate	Polystyrene	Polyethylene
Copper	Nylon	PVC	Acetal	Polypropylene
Zinc	Alkyed Enamel	Acrylic	Powder Paint	Tedlar®
Tin	Polyester			Silicone
Lead	Epoxy Paint	Polene® Paint	Kynar® Paint	PTFE
Anodized Aluminum	Polyurethane	Noryl®		Teflon®
Glass				Nylon?

2. Determine the Surface Condition

- a. **Question:** *Will the surface of this material be smooth or rough, irregular or curved?*
- b. **Surface Texture:** Surface texture and contour of a substrate can impact the adhesive bond. Pressure sensitive adhesives adhere best to smooth, clean, dry surfaces. A number of adhesive options are available for such “typical” surfaces as glass, stainless steel, ceramic, etc. However, a textured surface (fabric, open cell foam) or very rough or irregular surface (welds, seams or rivets) will require a thicker and/or aggressive adhesive to ensure a durable bond. Also, special consideration must be given when dealing with coated surfaces (painted and powder coated) as well as with substrates containing plasticizers or other agents that might migrate to the surface.
- c. **Surface Contour:** Where irregular angles are involved, more flexible face stock should be used. Regardless of the adhesive strength, it is virtually impossible for an adhesive to overcome continuous stress placed on it by a rigid or stiff material attempting to return to its original condition. This is referred to as a stock “memory”. In such applications, a more conformable backing should be chosen, such as tissue or non-woven material. By adding scores or perforations to the converted part will relieve stress.
- d. **Surface Contamination:** The presence of contamination such as dust, moisture, oils, plasticizers, powders on the surface of the substrate can prevent contact of the adhesive with the substrate. It is highly recommended to clean the surface in order to obtain an acceptable bond.

3. Determine the adhesive duration requirements

- a. **Question:** *Does the application require a permanent or temporary bond? If temporary, must the tape remove cleanly, for example when masking, surface protection or temporary holding?*
- b. **Permanent Adhesives:** Typically, permanent adhesives display good bonding characteristics and withstand most environmental conditions; however, performance depends on the surface, adhesive and environment to which it is applied.
- c. **Removable Adhesives:** When removed, the adhesive leaves little or no adhesive residue. Whether requiring a short-term or longer-term life, each removable application requires thorough testing to be sure the adhesive and surface are compatible.

- d. **Repositionable Adhesives:** Similar to removable adhesives, a repositionable adhesive allows a tape to be removed from a surface and applied again to the same or different surface without losing its effectiveness or leaving a residue. Adhesives with low or moderate initial tack serve this purpose, however they are dependent on the surface to which it is applied.

4. Determine the environmental conditions

- a. **Question:** *Will the tape be subjected to extreme temperatures, humidity, moisture, chemical substances and/or UV light?*
- b. **Environmental Considerations:** While rubber adhesive systems are very versatile and aggressive, they do not do well in heat. Any environment over 125°F continuous will probably require acrylic system. Excessive temperature and moisture variations can wreak havoc on a pressure sensitive system. Outdoor exposure and UV light will break down a rubber-based system rather quickly. As a rule, acrylic adhesives are recommended for outdoor use for they provide excellent UV stability and temperature performance. Solvent exposure may require a cross-linked adhesive.

5. Determine the application conditions

- a. How much stress is the adhesive expected to take, and in what direction is the stress expected to be applied?
- b. Does the tape need to be flexible?
- c. Would a certain thickness be more appropriate than another?
- d. Will the tape be applied by hand or machine?

6. Determine additional needs

- a. Does the application require a colored backing?
- b. Are there specifications that the tape must comply with such as military or ASTM?