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Adhesion of Flexible Magnet Strips:
Application Best Practices and Choosing the Right PSA

Magnetic products for engineering performance, imagination and invention.

Executive Summary

Pressure sensitive adhesives (PSAs) are commonly selected for application of flexible magnet strips. There are many choices, the most common being acrylic and rubber-based. In considering your selection, the substrate surface energy, environmental conditions (indoor/outdoor, moisture, heat, surface texture, and harsh chemicals), and cost are important factors.

Surface preparation is necessary to assure maximum adhesion. Temperature, cleanliness, and pressure are highly recommended. Complete surface contact and removal of air during lamination will improve the overall adhesion.

Intended Audience

This document is intended for manufacturers that use flexible magnets and have a need to adhere the magnet to a substrate.

Presented by Adams

This white paper is presented by Adams, a leading global manufacturer, and supplier of permanent magnets and magnetic assemblies.

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Choices abound when it comes to selecting a flexible magnet strip adhesive, including hot melt glues, wet glues and rubber cement. But for the overwhelming majority of magnet applications, pressure sensitive adhesives (PSAs) will be the most efficient and economical option.

However, once the decision has been made, the manufacturer must select between a PSA that is acrylic and one that is rubber-based. The proper selection will be critical in achieving a firm and reliable bond.

What are Flexible Magnets?

Made of thermoplastic material with a dark brown appearance, flexible magnets can be manipulated without affecting their performance. Combining strength with versatility, flexible magnet sheet and strip products can be twisted, bent, cut, coiled, printed or painted, making them a popular choice for use in signs and displays.

Acrylic vs. Rubber

Achieving a good bond starts with selecting the correct adhesive or adhesive construction to permit the maximum possible adhesion.

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In most applications, rubber-based pressure sensitive adhesives will provide the highest adhesion to the widest variety of substrates. Because of their aggressive nature, an excellent bond is usually easy to achieve. However, there are situations where they should not be the first choice as a result of their limited temperature, chemical, and U.V. exposure resistance.

Most high-performance acrylic adhesives are relatively firm and not as aggressive as their rubber counterparts. Since their ultimate adhesion is typically not as high, 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

Once an adhesive is selected, surface preparation must be completed before application. Optimal adhesion requires direct contact with the flexible magnet surface, so the substrate must be dry and free of any contaminants. Dust and other loose particles can be removed with a clean cloth or tack cloth, or blown off with an air-jet. Sometimes it may be necessary to remove loosely bonded coatings such as paint by scraping, or by using abrasives such as sandpaper or steel wool.

For contaminants such as oil, wax, silicone and similar lubricating materials, cleaning with a mild solvent such as isopropyl alcohol may be adequate. For some flexible magnet applications, it may be necessary to use a more aggressive product such as heptane, hexane, toluene or a chlorinated solvent. Caution should always be exercised due to the flammability and potential toxicity of these solutions. Always use clean cloths that are frequently replaced to remove the contaminant from the surface.

Surface Contact

It's the basic rule of adhesion: the more complete the contact, the better the bond. Once surface contaminants have been removed, and the correct adhesive/adhesive construction has been selected, the actual bonding process can begin.

There are three surface conditions that must be addressed:

- Rough Surfaces
- Mismatched Surfaces
- Smooth Surfaces

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Let's take a closer look at each of these.

Rough Surfaces

With an uneven surface, the proper adhesive product construction becomes even more critical. As the objective is to maximize contact between the adhesive and the surface, the PSA must be applied in sufficient quantity to achieve the thickness that will penetrate any dips and crevices in the surface. Pressure should then be applied to make certain the entire surface has been coated. Thicker adhesives can be softened with heat to make them more effective. Alternatively, a foam adhesive product can be used in a rough surface application.

Mismatched Surfaces

Often a thicker adhesive product construction is required to bond mismatched surfaces. Options include transfer tapes for smaller gaps or foam tapes to fill in as needed. As with a rough surface application, pressure should be used to assure complete, even contact with the flexible magnet surface. This pressure may have to be applied for a longer period to avoid later separation. Do not over-apply adhesive, especially in warmer conditions, as it could result in sliding or oozing.

Smooth Surfaces

While smooth surfaces are always more conducive to a secure bond, there may still be irregularities in a product that may not be readily visible. Thus, even with a surface that appears to be uniform, it is advisable to apply some pressure after the PSA is added. However, even if the adhesive is applied to the magnet strip and the product is left to rest, it will usually fill any minor irregularities without outside assistance within the next 12-24 hours.

Lamination

With pressure sensitive adhesives, if any air is entrapped during the bonding process it may have a negative impact on adhesion. Lamination can eliminate this potential hazard. For most applications, a laminating roll applied at a pressure of 15-25 lbs. per inch width of bond line is sufficient. In order for the adhesion bond to be most effective, adhesive tackifiers need to make contact with the substrate as soon as the release liner is removed and it is exposed to air.

Conclusion

For almost 70 years, Adams has offered an extensive line of flexible magnet products. We can fabricate most products in house to fit each customer's specific requirements. We know our adhesives and have written this paper as a general overview and introduction.

We're here to help make sure your design works flawlessly. Give us a call to go over your specific requirements, and we won't let you down.