Bonding Tapes Satisfy a Wide Range of Transportation Applications

NORBOND®

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Tapes are increasingly replacing mechanical fasteners in numerous transportation applications, where screws and rivets have traditionally been used. Tapes grant advantages such as reduced time and labor for installation, fewer surface irregularities and seams, elimination of potential sources for cracking and corrosion, waterproofing, and the ability to absorb or reduce impact, vibration and noise. They also provide an important advantage over traditional mechanical fasteners, since vehicle weight can be reduced and exterior surfaces and seams can be made more aerodynamic, thereby improving vehicle fuel economy. Because of these advantages, the use of tapes as a replacement for traditional mechanical fasteners in transportation vehicles will continue to grow.

The selection of an appropriate tape for a given application is critical to ensure ease of installation, proper adhesion, cleaner appearance and long-term reliability. Transportation applications have certain unique and demanding requirements that affect the selection of the tape.

Applications

Tapes are used in numerous vehicles, especially in the commercial and utility segments, such as trucks, buses, and trailers. These are used to secure exterior trim and emblems, roof and body side panels, and instrumentation. (Figure 2).

In the past, these applications would have needed to be assembled using screws, clips or other fasteners, which caused other problems. For example, the use of mechanical fasteners increases part count and assembly time, increasing material, labor and tooling costs. It is also difficult for mechanical fasteners to make assemblies water-tight, leading to premature rusting and failure of the fasteners or connecting parts. Mechanical fasteners can also increase forces and stresses in the vicinity of the fastener, causing unsightly waviness and compromising aesthetic appearance.

Figure 1: Tapes are used in numerous transportation applications.

Source: Adobe Stock

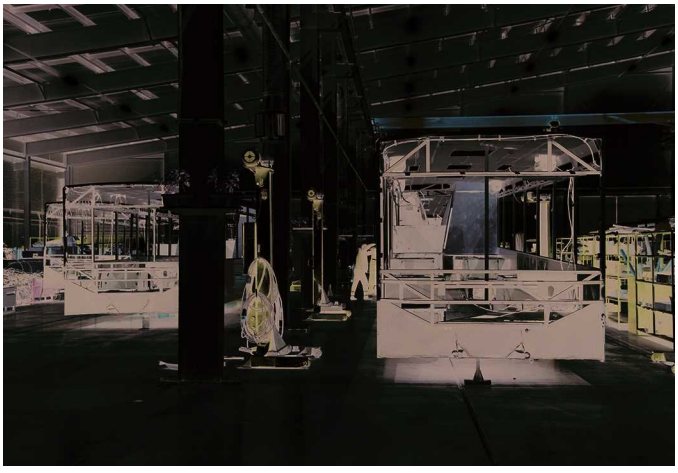

Figure 2: Tapes are increasingly replacing fasteners to secure trim, emblems, seals and more in commercial and specialty vehicles, like these buses.

Source: Melanie Kocheva/Adobe Stock

Requirements

Tapes used for transportation applications must satisfy several requirements. They must be easy to apply with minimal tooling to help cut costs, improve quality and streamline the vehicle assembly process. Once they are in service, the tapes must maintain their form, fit and function over the lifetime of the vehicle. Commercial and utility vehicles are especially vulnerable to severe operational and environmental conditions since they can be used by more operators and passengers over longer periods of time, and they are driven over longer distances. These extreme environmental conditions make the use of tapes for transportation applications especially challenging.

Temperature

The tape must be capable of adhering over a wide temperature range, and not become brittle in sub-zero temperatures or soft at high temperatures. The tape must also permit the thermal expansion and contraction of the components.

Water and moisture

The tape must be water-resistant, create water-tight bonds, and must not absorb moisture, expand or lose adhesion when subjected to high humidity or when directly exposed to water or other liquids.

Dynamic loads

The tape must be capable of withstanding dynamic bending, tensile, stretching, shock and vibration loads as the vehicle traverses over rough surfaces or if exposed to high dynamic pressure and wind by operation at high speeds.

Dimensional stability

The tape must maintain dimensional stability and maintain clean interfaces between assemblies that last for the lifetime of the vehicle when exposed to air, ultraviolet radiation, salt spray and other adverse conditions.

Features and characteristics

Transportation tapes are typically two-sided, and contain a substrate or carrier, which forms the body or core of the tape, and adhesives on either side of the substrate that bond the two parts, or adherends, together. A careful balance must be achieved between the substrates, adhesives and adherends in order to obtain strong, durable and long-lasting bonds. Considerations for carrier and adhesive materials are key to application success.

In general, the choice of carrier materials affects the tape's in-plane tensile and tear strength and can enable conformability of the tape to rough or irregular surfaces. Carrier materials can be either foams or films. Film tapes may not be suitable for transportation applications, since they concentrate loads at the immediate contact point between the substrate and the adhesive layer, causing high stresses that may lead to failure.

Foam tapes are advantageous to film tapes, as they can distribute loads over a larger surface area, thereby reducing stress and increasing life. They are also highly conformable and provide air- and water-tight seals. Foam tapes may also exhibit viscoelasticity, which is the ability of the tape to flow or relax when subjected to high stresses or temperatures, thereby reducing stress over time.

Foam carriers can be polyethylene, polyurethane or acrylic. Polyethylene carriers are generally used for basic mounting applications and offer good conformability to irregular surfaces and static shear resistance. Polyurethane carriers consist of highly engineered closed cell foams that contain flexible cross-links that allow for high strength, resilience and some viscoelastic properties. Acrylic foams are viscoelastic and provide high elongation and excellent stress relaxation properties.

Adhesives can be heat-activated or pressure sensitive acrylic, rubber or silicone. Acrylic adhesives are the best choice for transportation applications since they have good adhesion to a wide range of materials, good aging and resistance to ultraviolet radiation, and an ability to operate over a wider temperature range than either silicone or rubber adhesives.

Silicone adhesives may not be well suited for transportation applications. Although they have good high temperature adhesion, they may lack stiffness at room- and sub-ambient temperatures. Furthermore, they may require primers or other surface treatments to enable them to adhere to certain materials. Rubber adhesives may also not be the most appropriate choice for transportation applications since they may age poorly, have low resistance to ultraviolet radiation, and may have lower strength than acrylic or silicone adhesives.

Regardless of the substrates and adhesives used in the tape, numerous industry-standard tests are performed to characterize or qualify the strength and durability of the tape under static, dynamic, and thermal loads and environments over the simulated lifetime of the vehicle.

Saint-Gobain® Norbond® Tapes

Norbond Tapes offer a variety of options in different widths and thicknesses, using different carriers and adhesives that satisfy the most demanding environments and requirements for transportation applications. These tapes combine polyurethane, acrylic or polyethylene foam cores with high-performing pressure sensitive adhesives on both sides for permanent attachment. Two of these tapes, A7600 and V2800, are highlighted below.

Norbond A7600 series is a high-performance, double-sided acrylic foam bonding tape with outstanding viscoelastic and adhesion properties (Figure 3). It is well-suited for high- and medium-surface energy materials, such as metals or ABS plastics, and offers ideal bonding performance for many interior and exterior industrial applications. It can be used as a replacement for permanent fastening systems (rivets, welds and liquid adhesives) used in general industrial applications, as well as bus, truck and trailer skin and roof bow bonding.

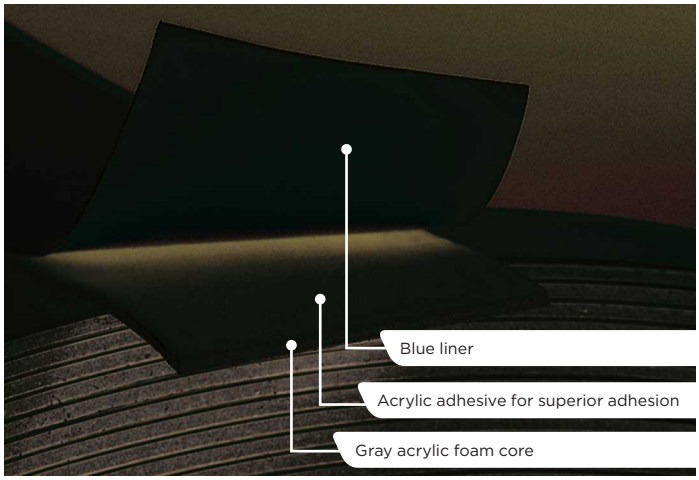

Figure 3: Norbond A7600 Tape.

Formulated for durable, long-lasting adhesion, A7600 exceeds industry standards for shear strength and bonding to high surface energy substrates, even at elevated temperatures. It has a high elongation/expansion capability, and quick adhesion build (80% of ultimate adhesion at 20 minutes). It is specifically designed to provide enhanced short-term adhesion performance to help aid in field assembly. It has excellent performance in peel, tensile and dynamic shear adhesion, and provides resistance and absorption of dynamic loads. It is available at a standard thickness of 1.1 mm (.043 in), and various widths from 6 mm (0.25 in) up to 800 mm (31.5 in).

Norbond V2800 series bonding tapes combine a black polyurethane foam substrate with a high-performance, pressure-sensitive acrylic adhesive on both sides that provides a strong, long-lasting bond (Figure 4). It is durable in all weather conditions and provides resistance against UV light, extreme temperatures, fungi, oxidation and ozone. Because of this, V2800 is an ideal choice for severe exterior bonding applications such as, emblems and ornamentation, trailer roof bows, panel stiffeners, and body side moldings.

Figure 4: Norbond V2800 Tape.

The V2800 series tape is specially designed to reduce the distribution of stress at pressure points, thereby minimizing distortion. It has high tensile/shear adhesion and is a good choice for shorter pieces (less than 1 m). Using a conformable, closed-cell polyurethane foam, it has excellent environmental resistance, and prevents corrosion of dissimilar materials by eliminating the contact between them. **Norbond** V2800 is available in a variety of standard thicknesses from (0.030 in to 0.120 in) in widths from 6 mm (0.25 in) up to 1,422 mm (56 in).

Contact Saint-Gobain

More information on the variety of tapes we offer for numerous transportation applications can be found on our website or contact us.

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