Keeping it Together – Bonding and Joining in Automotive Interiors

Putting a vehicle together requires joining various components - not just in obvious ways like installing a seat, but also in such areas as holding down carpet or trim. While it's possible to use mechanical fasteners for many things, they add weight. There are other options for many joints, but the right answer can depend on a lot of variables. Here we discuss some of the main attachment options.

Spray Adhesives

Spray adhesives are good for large surface areas where you want the bond to hold permanently everywhere with no separation, particularly carpeting, fabric or different foam layers inside a seat. Because the entire surface is bonded, each section is also contributing to holding its neighbors in place, so consistent adhesion everywhere is more important than extreme strength at any one point. 3M makes several adhesives suitable for this type of process, including both water-based and hot melt sprays. Because there are multiple options, other factors come into play such as VOC levels or how much design flexibility you need in case of a slight change in materials.

Reclosable Fasteners

Reclosable fasteners are designed as mated pieces that can be separated and rejoined whenever needed. This is useful for larger pieces that may need to be removed for repairs, particularly in the instrument panel or headliner. 3M™ Dual Lock™ Reclosable Fasteners feature mushroom-shaped polyolefin stems: when two pieces are pressed together, the stems flex and the mushroom heads slide past each other. After passing the opposing mating piece, the stems snap back into their original position and the opposing mushroom heads interlock. These fasteners can provide high tensile strength but can be opened by simply cleaving or peeling open the closure.

Liquid Adhesives

Liquid adhesives are used to create a permanent bond with less weight than mechanical fasteners, such as joining pieces of the door or instrument panel together. They range from flexible urethane adhesives to rigid high-strength two-part epoxy adhesives. Liquid adhesives generally require time to completely cure and the pieces often need to be held together while curing, so process considerations may come into play.

Hot Melts

Hot melts are often used "out of sight" on applications inside the door or instrument panel to hold pieces in place. Hot melts require just a few seconds to solidify as they return to room temperature. If you're using a polyurethane reactive hot melt (PUR hot melt) it will also continue to get stronger over hours or days until it is fully cured. In addition to requiring worker safety training the substrate must be able to withstand the heat of the glue, but hot melts generally have few or no VOCs. The heating required to keep the adhesive liquid until it's used is a process consideration.

Double-Coated Tapes

Double-coated tapes can be used to join two components or materials, and they are often used to attach automotive trim. The adhesive on each side of the carrier may be the same, or different adhesives can be used to match up to different substrates. The second adhesive is protected by a liner, so the tape can be applied and the component set aside until the matching component is ready to be attached. Double-coated tapes are often die-cut into custom shapes to fit specific pieces.

Single-Coated Tapes

Single-coated tapes are usually used to hold something against a substrate. The most common use for single-coated tapes in the automotive interior is to hold down wire harnesses in the headliner, doors or instrument panel. Single-coated tapes have been created specifically for different substrates, with a wide variety of initial tack and long-term holding properties.

Another subset of this category is foil tapes, created by adding an adhesive layer to a thin metal foil. These tapes are designed to take advantage of the thermal or electrical conductive properties of the metal foil, for instance to disperse or reflect heat away from a sensitive component.

Adhesive Transfer Tapes

Adhesive transfer tapes have no carrier, just a layer of adhesive protected by a liner. The adhesive is placed on one component, then the liner is removed when the second component is ready for attachment. Because the liner protects the adhesive the attachment of the second piece can be delayed indefinitely, which can help make your process more flexible.

Ultrasonic Welding

Ultrasonic welding is a technique in which two pieces are held together and then the energy of ultrasonic acoustic vibrations melts the contact point to create a solid-state weld. This method is commonly used for plastics, and particularly for welding a plastic to another piece of the same type of plastic. This is generally not an effective way to bond dissimilar plastics. Adhesives may offer a thinner bond line, and 3M also has a 3M™ Dual Lock™ Reclosable Fastener that is compatible with sonic welding.

Mechanical Fasteners

There are situations where mechanical fasteners such as bolts or screws are still the best overall answer, particularly where extremely high strength and durability need to be combined with disassembly. For instance, many components of a seat may be joined using other methods, but the actual attachment point to the frame is often still bolted so that the seat can be removed temporarily or replaced. 3M offers fastener adhesives to help make these fastening points as secure as possible.

Performance Labels

Performance labels aren't joining two separate pieces to each other, but they are attaching information to a substrate such as a door frame or the fabric of a visor. Because that information is about safety or some type of instruction for owners, the label has to remain legible for years in whatever environment and wear it's exposed to, and the adhesive has to last as long as the car, or possibly longer for some parts. 3M makes high-performance printable labels for specific substrates and exposure expectations, including resistance to extremely high temperatures and to automotive fluids.

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