



Fresh thinking pays off:
new solutions for
interiors suppliers



As the automotive industry emerges from one of the most challenging periods of its history, OEMs need suppliers with innovative approaches that will help them reduce vehicle cost and weight while maintaining — and even increasing — quality and customer satisfaction. At the Transportation Technologies Division of Velcro USA Inc., in-depth analysis of customer problems and a fresh look at their assembly processes have resulted in three new developments with the potential to save as much as \$9 per vehicle in direct and indirect cost. On a typical platform, that could easily translate into savings of \$1 million.

These new developments are:

- *a headliner assembly process that eliminates hot melt glue*
- *lower-cost seat trim fasteners that extend the traditional advantage of hook and loop over wires and rings*
- *improved magnetic attraction for assembly methods that involve metal tooling*

Hot Melt Replacement (HMR)

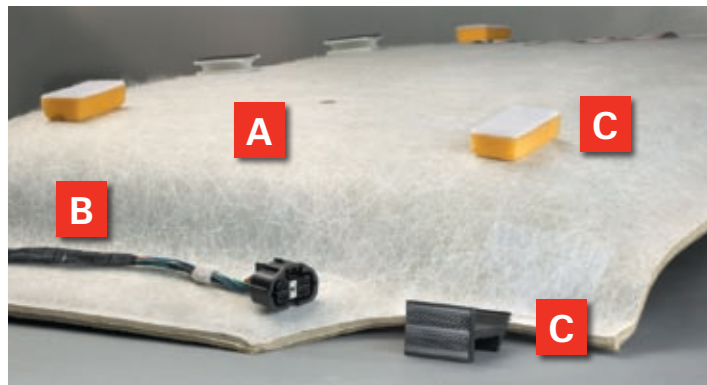
Traditional headliner assembly uses hot melt adhesive to secure wires, spacers and head impact countermeasures (HIC). The hot melt is applied to the "B" surface of the headliner, which is usually a layer of nonwoven scrim or craft paper thermoformed with layers of foam and fiberglass or composite board. Then the components must be held in place — manually or with fixtures — until the glue cures.

While hot melt creates a robust bond, it is not an ideal solution. About two pounds of glue is required to secure everything associated with a typical headliner, and at \$1.30 to \$2.00 per pound, this adds up quickly. Hot melt also makes it difficult to correct misaligned parts without tearing the scrim, and sometimes a bead of glue will show through. In addition, the hot melt guns and related machinery need regular maintenance and at some point must be replaced with new equipment.

A new system developed by Velcro USA Inc. uses a more economical scrim material that engages VELCRO® hooks in much the same way as VELCRO® loop engages them. The scrim mates with hooks

on the fasteners and spacers to hold the headliner securely, and with a new electrical tape for wire bundles that are routed under the headliner.

Key Elements



- A) New headliner scrim** provides excellent hook engagement, meets durability requirements and costs about \$0.90 a sq. yd. vs. \$0.70 to \$1.20 per sq.yd. for conventional materials.
- B) New e-tape** is thin and flexible with the look and feel of standard electrical tape plus extruded hooks to grip the scrim. It can be wrapped around wire harnesses just like tape — flag, spiral or candy-striped — and comes on rolls (no liner) like tape.
- C) Spacers and gap fillers** are made specifically to suit the vehicle, with extruded hooks to grip the scrim. Should the headliner be misaligned during assembly, it can simply be pulled down and adjusted without damage.

Head Impact Countermeasures (HIC) are components between the roof and headliner. These can also have hooks for attachment without hot melt.

All elements of the Hot Melt Replacement (HMR) system can be tailored to meet specific customer requirements (e.g., engagement strength, tear force, shear, etc.). In concept trials, all have performed well with a foam/fiberglass core and have demonstrated even easier processing and higher attachment strength with composite board.

Velcro USA Inc. is partnering with a headliner manufacturer to validate this system, and to confirm the benefits suggested by the preliminary studies.

These studies project that the HMR system can:

- save about \$1 to \$3 in hot melt glue per vehicle
- shorten the assembly cycle
- reduce scrap from correcting misalignments
- reduce vehicle weight by 1 to 1.5 lbs.
- eliminate work cells
- save money allocated for hot melt equipment and maintenance
- be more environmentally friendly than hot melt, and easier to disassemble for recycling

Savings in hot melt equipment maintenance, lower scrap and shorter assembly cycles will vary by plant, and will more than offset the slightly higher cost of components with integral hooks, such as e-tape. But just the projected savings in hot melt glue are significant, and increase with the size of the vehicle.

Type of Vehicle	Projected Glue Savings per Vehicle*
Large SUV	\$2.80 to \$3.00
Full-Size Sedan	\$2.00 to \$2.20
Mid-Size Sedan	\$1.80 to \$2.00
Compact	\$0.90 to \$1.10

*based on glue cost of \$2.00 per lb. and subject to roof size and sunroof, climate control and HIC options

Seat trim fasteners



A second example of innovation is more evolutionary than revolutionary. Seat manufacturers, particularly in North America, have known for years that they can

attach trim covers faster and more economically with hook and loop than with metal wires and rings (also known as hog rings). The process is simple: hook fasteners are molded into the seat pads during the foaming process so they can engage loop material sewn to the underside of the trim cover. The hook strips come in various lengths and widths, and can be diecut to suit seat styling.

While costs vary (seat design, geography, etc.) a comparison based on 2009 data from Europe results in a savings of nearly \$8.00 per car.

Costs per Vehicle Set:

	Ring and Wire – cost		Hook and Loop - cost	
Materials				
Foam pad components	Wires	\$1.61	Hook strips	\$4.12
Trim cover components	2 trim codes, woven fabric channel, inserted wire, and hog rings	\$8.77	LoopAuto tape	\$1.32
Materials total:		\$10.38		\$ 5.44
			MATERIALS SAVINGS:	\$4.94
Operations (hours times \$20.88 per hr.)				
Sewing and wire insert	Sew trim codes and woven channel; insert wires	\$2.70	Sewing, LoopAuto tape	\$1.33
Assembly	Hog ring equipment, operation, energy	\$2.32	Hook and loop assembly	\$0.67
Operations total:		\$5.02		\$2.00
			OPERATING SAVINGS:	\$3.02
TOTAL COST PER VEHICLE:		\$15.40		\$7.44
			TOTAL SAVINGS:	\$7.96

There are other important factors to consider, but their costs are more difficult to quantify. For example, when covers are misaligned during assembly, they can easily be removed and corrected if attached with hook and loop. Hog rings must be cut, producing scrap and necessitating a repeat of the hog ring operation. The extra time for this will vary with seat style.

Saving weight can improve both cost and fuel economy, and eliminating hog rings and wires reduces weight by about 600 grams (1.3 lbs.). Hog rings also require thicker foam pads so the wires can be buried sufficiently to avoid notice by the seat occupant, and thicker foam generally means higher cost. There are non-financial considerations, too: smoother seams are possible with hook and loop because it allows attachment along the entire length of the fastener, instead of just at the hog ring points.

Using hook and loop also streamlines inventory, as users can store a single part number (spools of LoopAuto™ tape) instead of 10 part numbers (trim codes, channels and wires). It also promotes recyclability, since trim covers can be disengaged from foam pads in seconds and foam can go to the shredder without a secondary operation to remove wires.

Despite all the variables, the savings from all these factors very likely add up another \$1.00 per car set, bringing the total savings to nearly \$9.00 per vehicle. And now two new VELCRO® brand touch fasteners promise to tilt the cost advantage even more in favor of hook and loop.

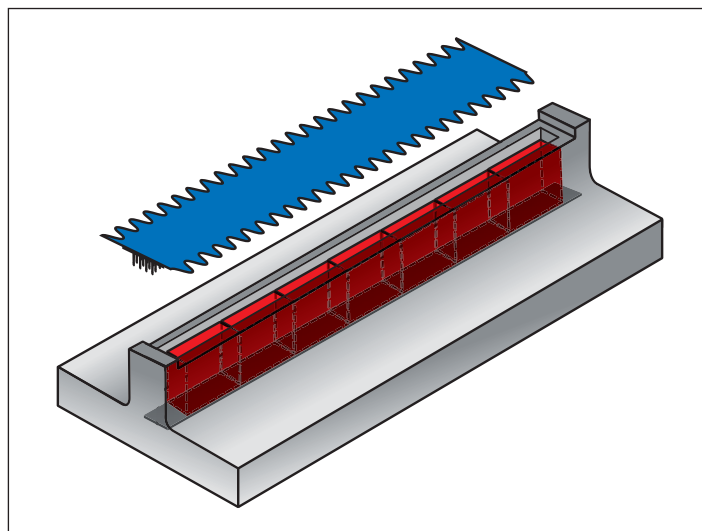
New designs lead to more savings

As usual, these new fasteners are molded into foam seat pads, so during the foaming process they are positioned in the tooling by magnetic attraction. Until now, this has required metal wire to be incorporated into each hook strip. But Velcro USA Inc. has now eliminated the wire (and its cost) by molding the ULTRA-MATE® High-Technology Hook (HTH) out of a ferromagnetic, mineral-filled nylon.

Gasketed (HF3) and non-gasketed (HR1) versions are available to suit customer requirements. In customer trials, key performance characteristics — strength of closure, foam adhesion, magnetic attraction, preventing foam intrusion — are comparable to, or better than, the popular M3G (which HF3 replaces) and MIGG 15 fasteners.



The wavy edges of the new HR1 are foam anchoring tabs to improve foam adhesion.



Magnets (red) in the tooling attract the HR1 fastener (blue) for positioning during the foaming process.



The gasketed HF3 has fewer components than M3G and uses simpler tooling, which is less costly and needs less maintenance.

FERROZONE™

A third development takes an equally innovative (and economical) approach to magnetism, and applies it to a process that doesn't even use hook and loop.

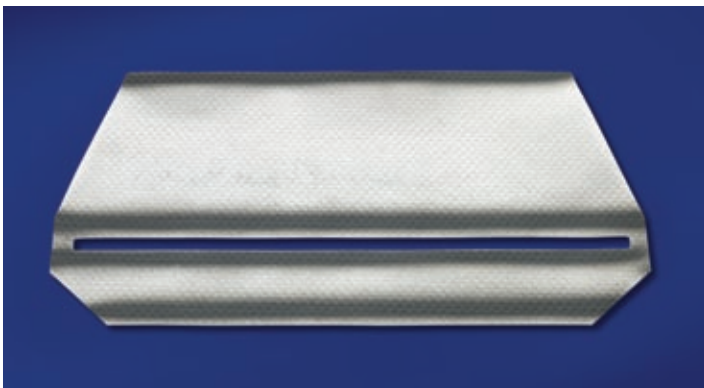
Many car and truck seats are made with inserts that strengthen the foam pad and help reduce noise. Like the seats, they must be located in the tooling with magnets during the production process. These magnets typically take the form of 19mm circles

called dots (or coins), which must be manually applied. It is not uncommon for as many as 30 dots to be used, or for some to fall off when subjected to the heat of the mold (180° to 200° F).

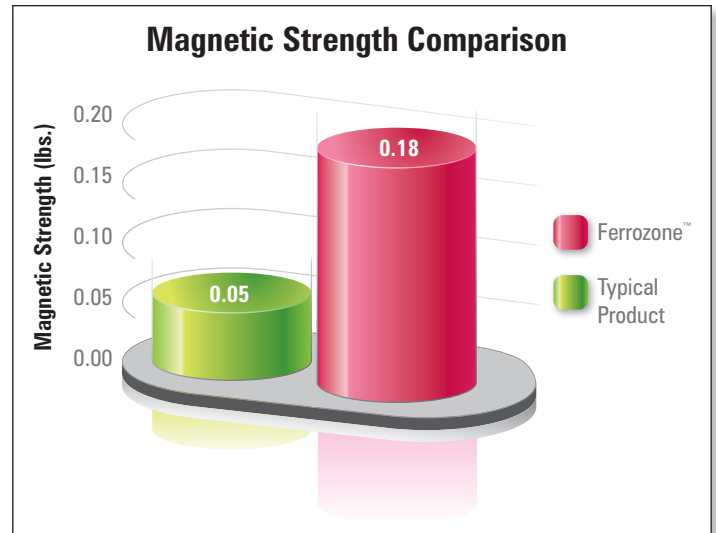


Typical seat insert with ferro-magnetic dots

Recognizing that an alternative to the dot method would be beneficial to customers, engineers at Velcro Canada Inc. came up with a simpler, more efficient solution. New FERROZONE™ seat inserts have their ferromagnetic properties applied mechanically, providing greater coverage and more magnetic attraction than manual dot application. This process is also faster and reduces cost by eliminating all the cutting, coating and scrap involved in producing coins. The amount of the cost reduction varies with the application.



FERROZONE™ seat inserts have larger ferromagnetic areas than is possible with dots, shaped to match customer requirements.



FERROZONE™ seat inserts provide a magnetic strength three times greater than the typical stick-on product, and are not affected by temperature. Furthermore, they can be customized to a customer's unique requirements. For example, manufacturers can now match a ferromagnetic area to their tools, with lines or even curves. One user has replaced dots with a 10mm-wide zone to achieve a much stronger attraction.

Another advantage is the potential for different colors... left-hand and right-hand parts can be color-coded to make it easier for assemblers to identify the one they need.

While this innovation was developed for seat inserts, which are usually made of nonwoven fabric, polyester or polypropylene, it should work on most fabrics and plastics and has the potential for other applications.

Conclusion

The developments described in this white paper are the latest in a series of solutions to automotive customer problems developed by the Transportation Technologies Division of Velcro USA Inc. The Velcro USA Inc. team is committed to helping the automotive industry reduce cost, weight, scrap, and assembly time, while making assembly processes more ergonomic and environmentally friendly.

For more information about these innovative approaches, or to partner on a new solution, please contact Velcro USA Inc., Transportation Technologies Division, 1210 Souter, Troy, Michigan, (248) 583-6060, www.velcro.com, e-mail auto@velcro.com.