3M
VHB™ Tape
Flex Testing of Truck Trailer Panels

Background

A beverage truck and trailer body manufacturer began a research and development project to evaluate various fastening techniques as alternative methods to slug welding of interior and exterior body panels. The firm sells unitized body beverage trucks and center-framed trailer housings to beer and soft drink companies. The bodies are built on conventional truck or trailer chassis, with paint and film graphics applied to meet the customer's specifications.

The traditional assembly process consisted of welding aluminum panels to the underlying aluminum framework. While this method is generally acceptable in structural terms, it may present a rough surface with poor visual appeal. Welds occasionally fail, which may lead to noise and panel flexing. The slug welds on interior bulkheads had to be ground down to a smooth surface so they would not wear through cartons and aluminum cans.

Test Procedure and Results

Various fastening techniques were tested by the truck and body manufacturer, including conventional welding, rivets, one and two-part resin adhesives and 3M™ VHB™ Acrylic Foam tape 4945. The foam carrier of the VHB tape is .045-inches thick with a firm pressure-sensitive acrylic adhesive on each side.

An aluminum frame test bed was used for performance analysis of each of these prospective fastening methods. This device was suspended on one side by a motorized rocker arm. A gasoline engine powered the rocker arm, flexing the panel in a 1.25 inch elliptical path at 45 degrees from the panel's vertical center line at a rate of 500 to 600 cycles per minute. Samples of each fastening method were attached to the test bed.

The outdoor test setup was activated September 1, 1983, and ran through the winter months until March 31, 1984, with an estimated 7.5 million cycles – equivalent to approximately 15 years of typical over-the-road panel stress. The normal lifespan of a beverage truck or trailer is estimated at eight years.

After the first week, all of the epoxy resin bonds to the panels had failed. By the end of the test period, all of the riveted portions had broken free. Half of the slug welded panels had failed or welds had cracked as a result of the continuous pounding.

The panel fastened with the VHB tape was still secure at the end of the seven month test period and showed no signs of failure, indicating that the cushioning and isolating effect of the foam helped the adhesive resist constant vibration.
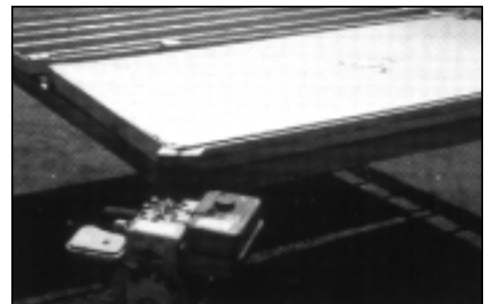
Technical Bulletin
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Production Benefits or Advantages	Possible benefits gained from the use of 3M™ VHB™ tape can be multiple. From a manufacturing point of view, assembly can be simplified, often with lower labor content. The manufacturing energy component may also be lower because costly aluminum welding may be reduced or eliminated. The need for labor-intensive grinding to prepare welds for finishing may also be reduced or eliminated.
	The VHB tape is resilient and can help damp vibration that can lead to shear weld points, pull out rivets and introduce cracks. Because there are no weld protrusions the tape assembly process can help reduce damage caused to beverage packaging carried in the truck or trailer from protrusions. The smooth finish of exterior body panel helps simplify the application of body paint and film graphics. The VHB tape's high peel strength, resistance to solvents, moisture and ultraviolet light, and the excellent sound and vibration damping properties make it useful for many interior and exterior applications where mechanical fasteners or welding have commonly been used.
For Additional Information	To request additional product information or to arrange for sales assistance, call toll free 1-800-362-3550 or visit www.3M.com/adhesives. Address correspondence to: 3M Engineered Adhesives Division, 3M Center, Building 220-7E-01, St. Paul, MN 55144-1000. Our fax number is 651-733-9175. In Canada, phone: 1-800-364-3577. In Puerto Rico, phone: 1-787-750-3000. In Mexico, phone: 52-70-04-00.
Important Notice	User is responsible for determining whether the 3M product is fit for a particular purpose and suitable for user's method of application. Please remember that many factors can affect the use and performance of a 3M product in a particular application. The materials to be bonded with the product, the surface preparation of those materials, the product selected for use, the conditions in which the product is used, and the time and environmental conditions in which the product is expected to perform are among the many factors that can affect the use and performance of a 3M product. Given the variety of factors that can affect the use and performance of a 3M product, some of which are uniquely within the user's knowledge and control, it is essential that the user evaluate the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method of application.
Warranty	3M warrants for 24 months from the date of manufacture, that 3M™ VHB™ Tape will be free of defects in material and manufacture. 3M MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. This Limited Warranty does not cover damage resulting from the use or inability to use 3M™ VHB™ Tape due to misuse, workmanship in application, or application or storage not in accordance with 3M recommended procedures.
Limitation of Remedies and Liability	If the 3M™ VHB™ Tape is proved to be defective within the warranty period stated above. THE EXCLUSIVE REMEDY, AT 3M'S OPTION, SHALL BE TO REFUND THE PURCHASE PRICE OF OR TO REPAIR OR REPLACE THE DEFECTIVE 3M™ VHB™ TAPE. 3M shall not otherwise be liable for loss or damages, whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including negligence, warranty, or strict liability.

(ISO 9002)

This Engineered Adhesives Division product was manufactured under a 3M quality system registered to ISO 9002 standards.

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