

Technibond

bonding industry together

Commercial Vehicle Report



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Double-sided Tapes for Commercial Vehicle Bodybuilding

Introduction

Technibond have been supplying double-sided tapes to commercial vehicle bodybuilders for well over 10 years. The main application is bonding aluminium and GRP roof skins to the structural skeleton of roof sticks, although we also supply tapes for other uses such as bonding internal bump rails and external emblems in place, and for various sealing applications. This report covers the roof bonding application.

During the time we have supplied this market we have used the experience gained to progressively improve one of our products, Technibond HTA 2mm, to make it particularly suitable for this use. We now have an impressive customer list of large reputable companies using this product for curtain-sided and box trailers, including refrigerated vehicles. In many cases our HTA tape has replaced gun applied structural polyurethane adhesives, or extruded rubber-resin tape (“toffee tape”).

Advantages of Technibond HTA

1) Compared to Polyurethane Adhesives

- ▶ **Cost** Technibond HTA is far more economical and the cost can be accurately controlled. One 50m roll of HTA can replace 13 cartridges of polyurethane.
- ▶ **Control** HTA is supplied in rolls cut to any width, with a controlled thickness. Gun applied adhesives must be applied at a consistent thickness to achieve correct cure, usually 3mm, which requires inconvenient spacer blocks or tape, and good operator control.
- ▶ **Cleaning** Cleaning is less critical and can use simple cheap solvents. Special cleaners and hazardous primers are not required.
- ▶ **Time** HTA does not cure; an immediate bond is formed as soon as pressure is applied, and the roof can be moved very quickly after construction. PU adhesives require a cure time of up to 24 hours, and the cure time depends on temperature. HTA is also quicker to apply.
- ▶ **Mess** HTA forms a clean bond line and will not squeeze out of the joint. The visible appearance of the roof from inside the vehicle is much improved

2) Compared to extruded tape

- ▶ **Cost** Technibond HTA is far more economical
- ▶ **Flexibility** HTA is available slit to any width and in longer more convenient rolls.
- ▶ **Performance** HTA outperforms extruded rubber tapes, particularly at high and low temperatures. Full details are contained in this report.
- ▶ **Liner** Technibond HTA is available with our production aid liner for ease of use. Details are given later.

Requirements of this application

The balance of adhesive properties is critical in this application. The product has to bond to aluminium, galvanised steel and GRP, and absolute cleanliness cannot be assured. The product has to bond under cold winter conditions when the tack of all adhesives is reduced. And the product should resist the high temperatures that will occur in service and may occur during paint baking. Very high shear strength is not required, but good shear strength, very high tack and a wide temperature range is necessary. The Technibond HTA formulation has been perfected to achieve this.

The tape thickness is important, and we believe from experience that 2mm is optimum. This thickness fills any height differences and provides good elasticity to absorb movement.

Quality is also essential, because if a roof fails the costs of re-work are very high. Technibond HTA is coated for us by one of Europe's most advanced coaters, with quality control second to none, and approved to ISO 9001. Technibond are also approved to ISO 9001 with a full adhesive test laboratory of its own.

Tests performed on Technibond HTA

1) High temperature testing

Several customers have asked us to investigate the high temperature strength of our HTA compared to an extruded rubber-resin tape. We were supplied with samples of this tape together with samples of sheet aluminium and GRP to test the adhesion at various temperatures. It is recognised in the market that rubber-resin tapes do give problems when high temperatures are encountered, and we were looking to prove that the acrylic adhesive of Technibond HTA would out-perform the rubber based tape. Modern solventless paint systems often require higher temperature baking and more failures are now being reported.

Test Details

Tensile tests were carried out as this would mimic the lifting effect of the roof skin during high temperatures. The 100mm x 6mm lengths of the products were used to

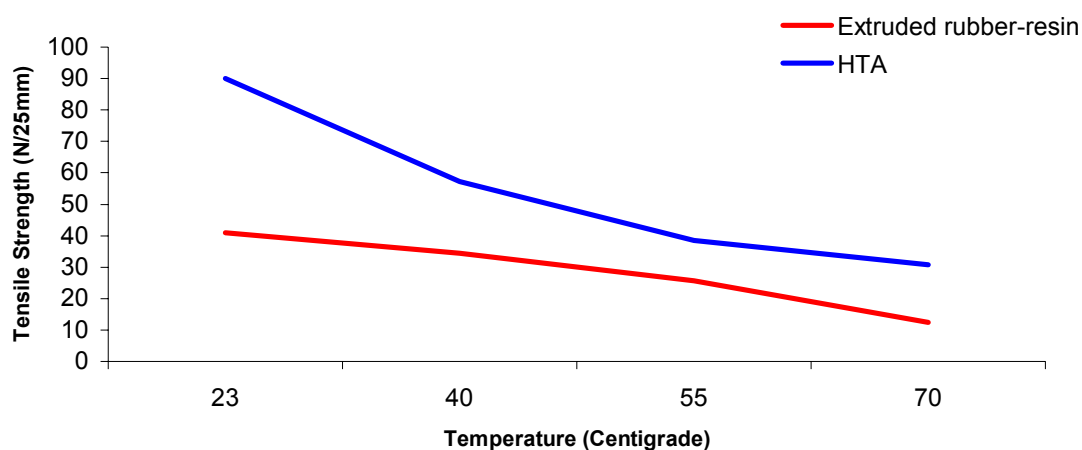
bond a strip of GRP to a steel plate, and allowed to dwell at a given temperature for two hours, before the tensile tests were performed. To gain an overall picture of the performance of each of the products the tests were carried out at four different temperatures (23°C, 40°C, 55°C and 70°C). Each test was repeated and an average result was calculated to provide a tensile result in Newtons per 25mm.

Results

The table below shows the results for the series of tensile tests.
Test speed = 10mm/min.

Temperature	Product	Mean Tensile Strength (N/25mm)
23°C	Extruded rubber-resin	41.0
	HTA	90.00
40°C	Extruded rubber-resin	34.4
	HTA	57.19
55°C	Extruded rubber-resin	25.6
	HTA	38.54
70°C	Extruded rubber-resin	12.5
	HTA	30.69

Mean Tensile Strength of Products.



Comments

The results from the tests reveal that the Technibond HTA significantly outperformed the current extruded rubber-resin product.

The final results for the extruded rubber-resin product (at 70°C) proved difficult to measure as the product had started to liquefy.

Technibond HTA does give significantly better performance at high temperatures.

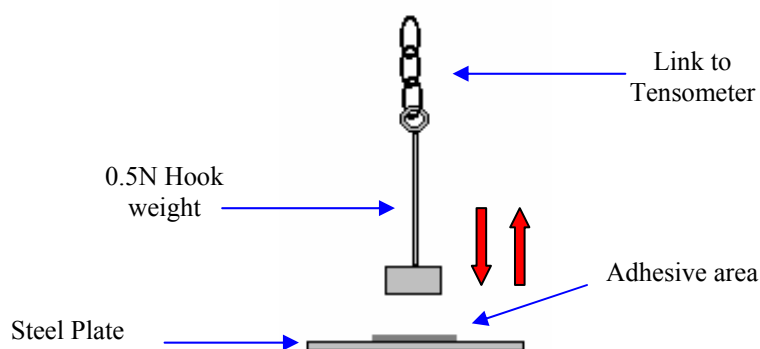
2) Low temperature testing

Some customers have also been concerned whether our HTA would bond well at low temperatures, as roof construction often takes place under cold conditions when extruded rubber-resin tapes can give adhesion problems. We tested the tack and adhesion of HTA and extruded rubber-resin at close to 0°C and at 23°C, and compared the results.

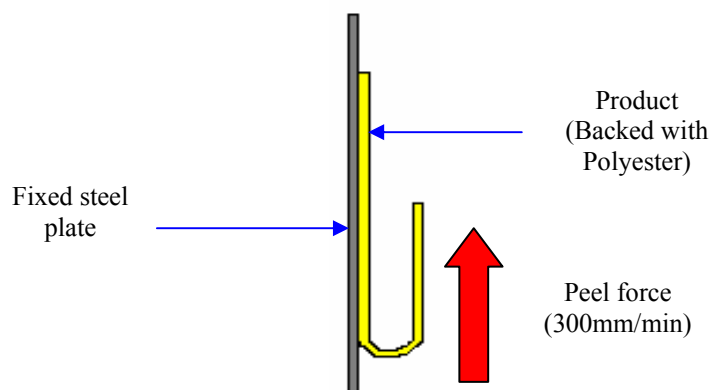
Test Details

Samples of both products were bonded to steel plates, half of which were then stored at 23°C, while the remaining half were placed in a refrigerator set to its lowest setting. The temperature was checked by calibrated thermometer and was approximately 0°C. The samples were left for 24 hours at the respective temperatures. then removed from the controlled temperature areas one at a time and tested for tack as shown below. The tensometer lowers the 0.5N hook weight until it makes contact with the adhesive surface, then the weight is lifted and the forced required to detach the hook weight from the adhesive surface is measured. To help ensure a fair test multiple tests were carried out on each product and an average result calculated. This tack test measures the immediate bond strength formed with very low contact pressure and very short dwell time at the stated temperature. Additionally, peel adhesion tests were carried out on the HTA product, to discover whether the low temperature causes any reduction of the adhesive strength of the HTA for this application. Adhesive strength is measured with firm application pressure and a longer dwell time.

Tack Test.



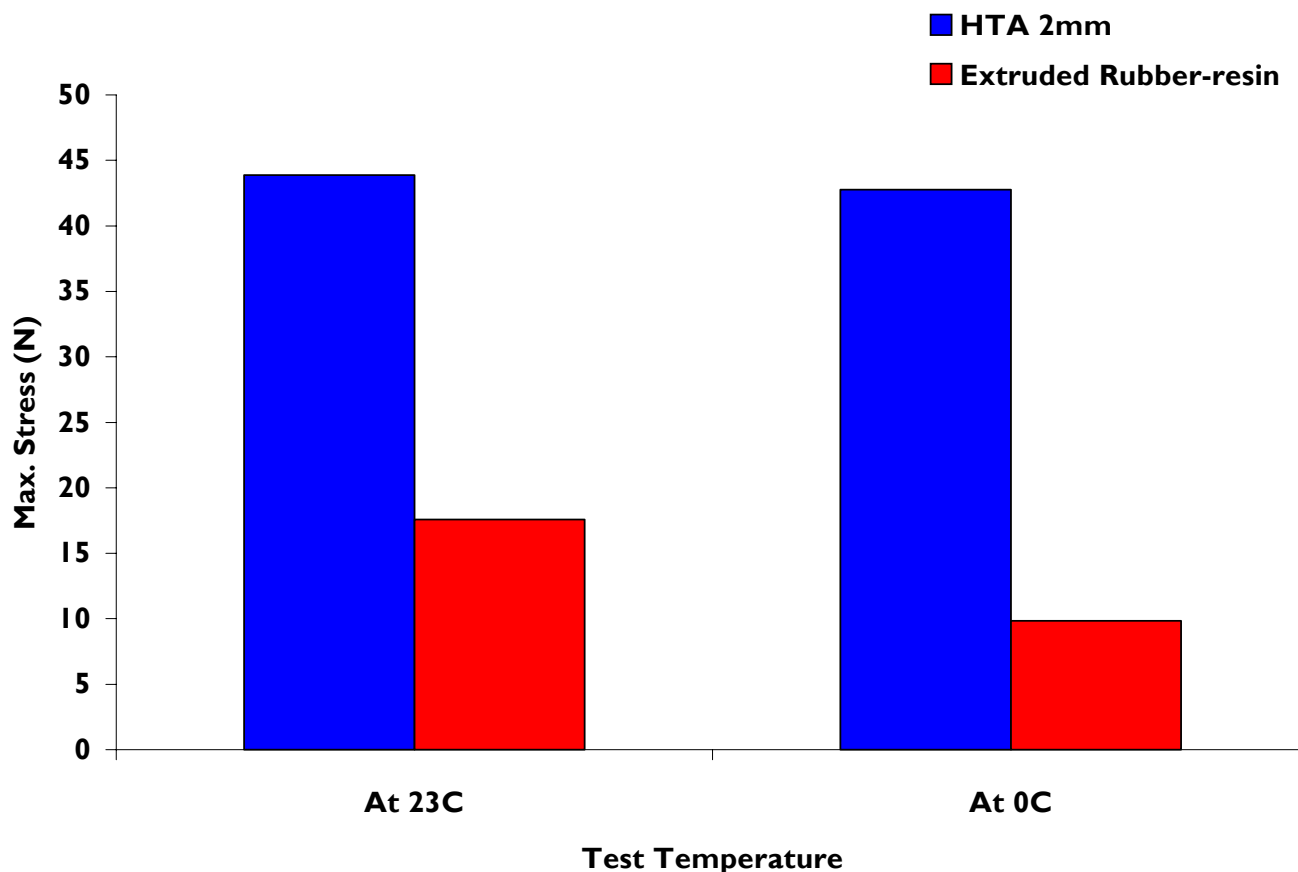
Peel Adhesion Test.



Results

Tack Test.

Tests speed = 100mm/min. Dwell Time = 0 seconds.



Peel Adhesion Test at 0°C

Peel adhesion testing of the HTA revealed that the product gave foam tear in every test. This is the same result as we achieve at 23°C, so the low temperature had no effect.

Comments

The results revealed that the HTA product has a greater tack than the extruded rubber-resin product at both 23°C and 0°C. The results also showed the extruded rubber-resin to lose approximately 45% of its tack at 0°C compared to 23°C, whereas the Technibond product HTA showed no significant loss of tack at 0°C.

The peel adhesion results for the HTA confirmed that the HTA is not significantly affected by low temperature. A foam tear result shows that the adhesive bonded so well that foam failure occurred before the adhesive.

Our HTA product uses a modified acrylic adhesive, giving the product a high tack even at relatively low temperatures. The extruded rubber-resin product uses a rubber based adhesive which is typically more affected by low temperature.

Recommendations for using Technibond HTA

1) Cleaning

We recommend cleaning the roof sticks and cross-members by wiping with a tissue moistened with isopropanol.

We also recommend cleaning aluminium roof sheets at the position of bonding to the sticks by the same method.

2) Use of tape

Use Technibond HTA or HTAF (production aid film liner) 2mm thick and the same width as the roof sticks. Apply the tape to the cleaned roof sticks without touching the adhesive surface. Use slight tension to keep the product straight but be careful to avoid stretching it (especially HTAF) and use only light pressure. If tape is mis-applied it can usually be removed if this is done immediately, but after a very short time the bond is permanent. Once the tape is lightly bonded in the correct position, press it down firmly along the whole length.

3) Bonding the roof

a) Using our production aid liner (HTAF)

When the roof skeleton has been completed and taped, peel back about 3 inches of the film release liner from each end of the sticks, leaving this tab hanging to the side.

Pull the roof sheet in place and cut to length as normal. When the sheet is ready to be bonded, use the release tabs to peel out all the lengths of release film from underneath the roof. Use a suitable method to apply pressure on top of the roof skin in the positions of the tape, to ensure a good bond.

Continue as normal.

The advantage of this method is that the roof sheet is bonded flat and tension-free, and any slack can be removed before bonding. Also, the open tape is not left exposed to contamination from the air prior to bonding.

b) Using normal HTA

Leave the release paper in place, pull the roof sheet into place and cut to length. Roll back half the sheet and clean at appropriate positions. Remove the release papers from the exposed taped roof sticks then carefully roll back the sheet on to these sticks. Repeat this for the other half of the roof. Then use a suitable method to apply pressure on top of the roof skin in the positions of the tape, to ensure a good bond.