All you need to know about

ADHESIVE BONDING ASSEMBLY

3M Preferred Converter

ADDEV MATERIALS

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INTRODUCTION

Assembly is an issue that requires careful consideration, as non-compliant assembly can damage or even devalue a product. The entire production line can suffer the consequences.

Adhesive materials can replace traditional mechanical fastening methods, improving manufacturing efficiency in a wide range of industries.

ADDEV Materials is here to explain how to obtain the ideal assembly for your project.

OUR E-BOOK WILL HELP ANSWER ALL YOUR QUESTIONS!

ASSEMBLING MATERIALS

Assembly involves joining two materials together to create a mechanical bond.
In this paper, we'll look at different assembly techniques.

01

What is an assembly?

All materials can be assembled, but the effectiveness of the assembly will depend on a large number of physico-chemical parameters. The selected assembly process must, therefore, meet the constraints and requirements of your specifications.

Here are the parameters to consider:

- **What materials need to be assembled?** (metal, plastic, composite, wood, glass, etc.)
- **Are there any treatments available?** (pickling, corona, plasma, primer)
- **How rough is the surface?**
- **What is the gap between the two materials?**
- **What is the size, weight and density?**
- **What are the mechanical constraints?** (static, dynamic, static/dynamic shear, traction, peeling, cleavage)
- **What is the environment like?** (temperature, UV, humidity, contact with chemicals)
- **What is the assembly process?** (manual, semi-automatic, automatic)

02

Different assembly techniques

Mechanical assembly

There are an infinite number of mechanical assembly methods. These are the most widely known:

Indirect mechanical assembly examples

- Welding
- Riveting
- Screwing
- Nailing
- Stapling
- Etc.

Direct mechanical assembly examples

- Irreversible elastic interlocking between 2 parts. Assembly method frequently used in the plastics industry
- Shrink-fitting: assembly of 2 parts by reversible deformation using controlled mechanical tolerances

Mechanical assemblies: Disadvantages

Indirect mechanical assembly methods have the disadvantage of causing weak points in the mechanical properties of materials (cracks, deformation, drilling, etc.)

Adhesive bonding

Adhesive bonding is a method used to assemble 2 materials with an adhesive mass.

Thanks to the technical progress made by manufacturers, it is now possible to assemble virtually all materials for applications with semi-structural performance.

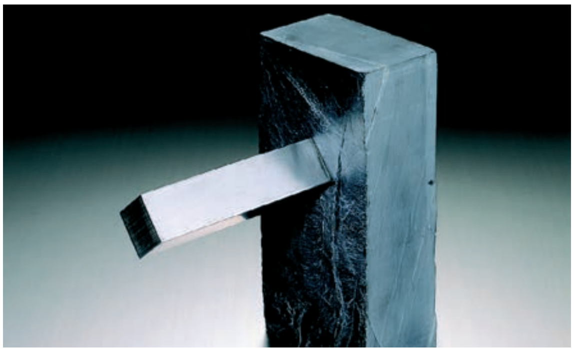
Gluing

Gluing has the advantage of being discreet, making the assembly virtually invisible.

This method also enables extremely strong structural assemblies to be produced. The adhesives used are generally:

- epoxy
- acrylic
- polyurethane

For example, LED road signs can be assembled by gluing, although they have to withstand external stresses (wind, cold, heat, etc.).



GLUING: ADVANTAGES

Adhesive bonding methods make it easier to join two materials of different types, unlike welding or spot welding.

Note: Gluing is an automated process compatible with industrial robotics.

VHB® ASSEMBLY

Adhesive tapes are an alternative to traditional assembly methods such as welding or screwing. Find out why VHB® assembly is a versatile assembly solution, as well as some best practices for implementation.

01

What are VHB® foams?

3M™ VHB® tapes are a range of double-sided foam adhesive tapes made from high-performance acrylic adhesives. These tapes form bonds with exceptional strength and have greater durability and elasticity than conventional double-sided foam tapes.

The range of 3M™ VHB™ tape products includes tapes with different core constructions and a variety of adhesives. All 3M™ VHB® tapes use closed cell technology and offer exceptional environmental resistance and durability.

3M™ VHB™ tapes are primarily used for the assembly of:

- plastics (composites, TPE, TPO, PE, PP and low surface energy (LSE) plastics without primers)
- paints, powder coatings and irregular surfaces
- transparent materials
- materials subject to high temperatures (metals, steel, aluminium, etc.)

VHB® ADVANTAGES

As well as being versatile, assembly methods using VHB® have the benefit of not altering the core properties of the materials, unlike welding and indirect mechanical assembly.

The superior performance of 3M™ VHB® tapes means that they can often be used to replace mechanical fasteners to join a wide range of materials.

VHB® foams for assembling materials

3M™ VHB® double-sided adhesive tapes are methods of assembling materials which continue to improve thanks to advances made by 3M™.

VHB® products are an excellent illustration of this continuous innovation: after more than 40 years, the VHB® brand is now recognised as the benchmark when it comes to assembling low and high surface energy materials.

Assemblies using double-sided adhesive tapes have several advantages:
- Using them does not require any particular technical skills, unlike welding, for example.
- They do not damage the materials being joined in contrast to riveting, screwing or other mechanical methods.
- They can be used to create discreet, sometimes almost invisible, assemblies without the need for alterations.
- They respond to a number of challenges, including watertight, visually appealing and safe assembly.

WHICH VHB® SHOULD YOU CHOOSE?

- 3M™ VHB® LSE tapes for low surface energy plastics such as TPE, TPO, PE, PP and composite materials
- 3M™ VHB® 5925, 5952 and 5957 series tapes (high temperature resistance and versatility), which allow numerous assembly possibilities on a large number of different materials (paint, powder, epoxy)
- 3M™ VHB® 4910 tape for optical applications

Semi-structural VHB® use example

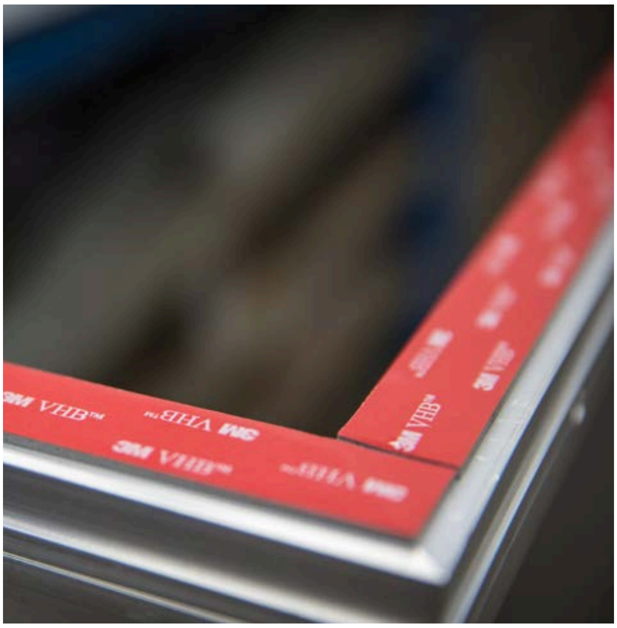
VHB®s are commonly used in many areas of industry

Outdoor semi-structural applications:
- Bonding steel stiffeners to road signs
- Fastening and covering signs

In the furniture industry: Bonding foam for seats

Buildings/Street furniture:
- Fastening aluminium profiles, bonding stainless steel, wood, etc.
- Manufacturing joinery (doors, windows, conservatories, etc.)

02 What materials can be used to assemble VHB® technology?



Assembly and material surface energy

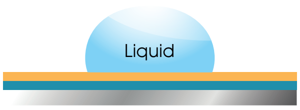
The easiest materials to assemble are those with very high surface energy, i.e., metals. Materials with very low surface energy are the most difficult to assemble.

These are mainly:

- fluorinated polymers (PTFE, PVF)
- polyethylene (HDPE)
- polypropylene
- polystyrene

Between the two categories are most of the high surface energy plastics that are commonly bonded in industry (PVC, ABS, polyester, nylon, polyimide, PMMA, etc.)

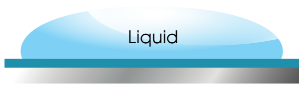
Low surface energy



Wax-painted metal (polyethylene)

High surface energy 38 dynes / cm

High surface energy



Painted metal (acrylic or enamel)

LSE plastics	Surface energy Dyn / cm
PVA	37
Polystyrene	36
Acetal	36
EVA	33
Polyethylene	31
Polypropylene	29
PVF	28
PTFE	18
powder coating	**

HSE plastics	Surface energy Dyn / cm
Polyimide	50
Phenolic	47
Nylon	46
Enamel	45
Polyester	43
Epoxy paint	43
Polyurethane	43
ABS	42
Polycarbonate	42
PVC	39
Noryl	38
PMMA	38

Metals	Surface energy Dyn / cm
Copper	1103
Aluminium	840
Zinc	753
Pewter	526
Lead	543

03

What are the best practices for applying VHB®?

Assembly is subject to several parameters that need to be taken into account to determine the right VHB® foam to meet specifications while addressing constraints and objectives.

Cleaning the surfaces that will be glued

The essential step in applying any adhesive is cleaning the surface to remove any contaminants. The products used vary greatly depending on the materials to be cleaned.

It is, therefore, essential to use compatible products.

Complying with application constraints

Adhesives are highly complex chemical products whose properties vary according to a number of factors. Therefore, it is imperative to respect bonding constraints, including the:

- Application temperature
- Length of time the temperature must be maintained if an oven will be used
- Humidity of the room (curing is sometimes required)

CONCLUSION

As we can see, there are many challenges to be met:

- Assembling materials of different types and thicknesses
- Reducing the deterioration of materials during assembly
- Simplifying production stages
- Lightening the weight of assemblies and reducing energy consumption
- Improving elasticity and watertightness during assembly
- Increasing productivity

Whether using traditional or modern methods, assembly is an essential part of the production process.

The choice of materials is intrinsically linked to the selection of techniques. It is necessary to adapt to the requirements of the specifications to be met.

ADDEV Materials has established itself as a turnkey solutions integrator in the adhesive assembly market.

Our strengths: **technical expertise, know-how in materials processing and a range of tailor-made services**

Would you like support during the assembly stage of your products?

Our development and innovation teams are always ready to listen to your needs. We are on hand to help you complete your project.

Get in touch with one of our experts!

LET'S DISCUSS YOUR PROJECT →

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