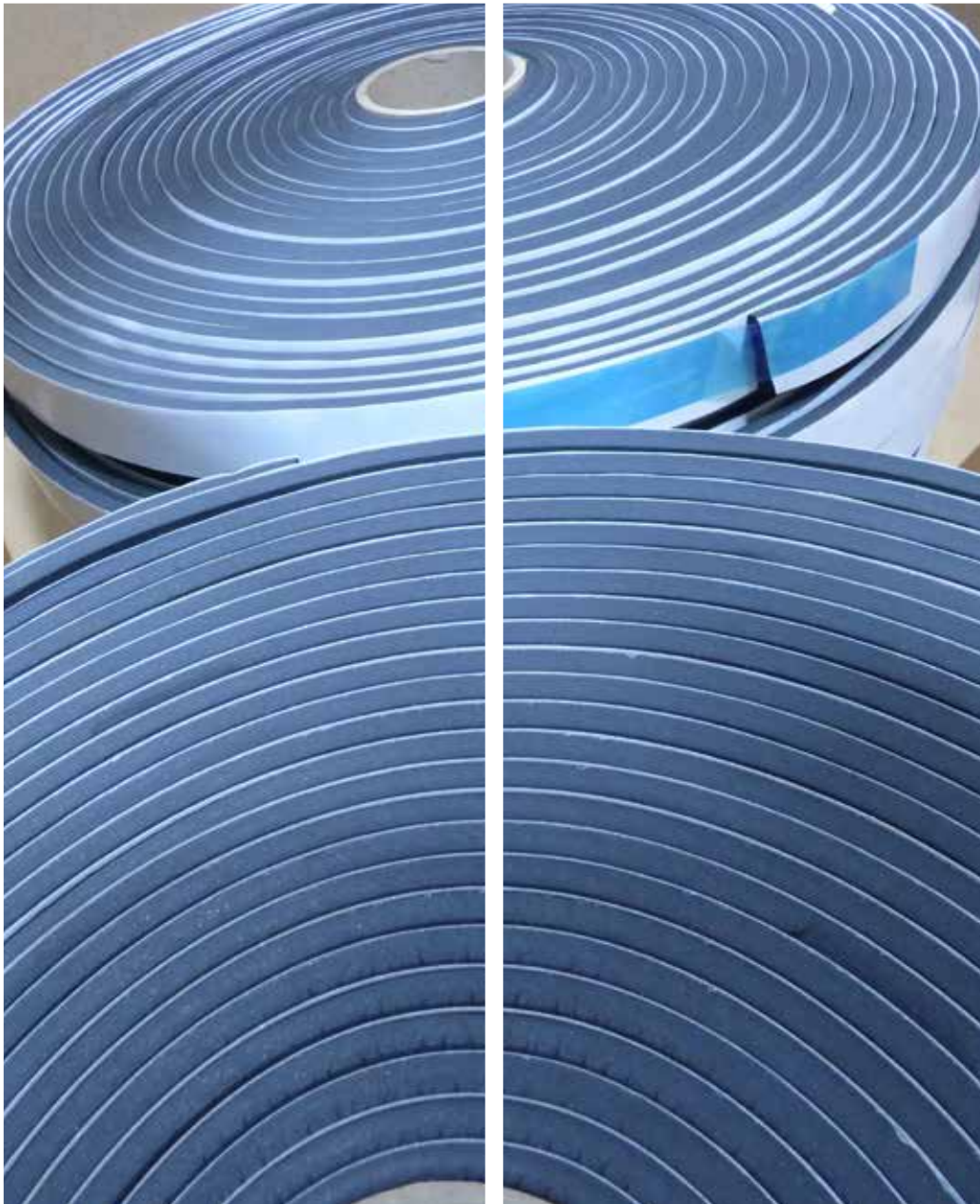


## CASE STUDY

# Component Foam Bonding Study

Determining the optimal adhesive when bonding to foam and other materials may be challenging, especially when seeking to provide a customer an accurate quote quickly. To help Converters simplify adhesive choices and feel confident in the combinations, Avery Dennison Performance Tapes along with Armacell, has performed an adhesive bonding study. This study reviews customer technical requirements while highlighting performance tape adhesive combinations utilizing Armacell foams. **Armacell in action.**

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MAKING A DIFFERENCE AROUND THE WORLD

# Managing a Sticky Situation

## Simplifying a pressure-sensitive adhesive selection process

**Project:**

Component Foam Bonding Study

**Industry Partner:**

Avery Dennison Performance Tapes

**Challenge:**

Not all adhesives work with all foam polymers. The result of poor adhesion or incorrect product selection can be cumbersome and costly, and researching the right pressure-sensitive adhesives (PSA) that are compatible with foam substrates can be time consuming.

**Solution:**

Avery Dennison has streamlined the selection process of compatibility and conducted a “bonding study” utilizing three Armacell engineered foam product families and the Avery Dennison Cores Series™ Portfolio adhesives. As a result, a quick reference guide has been created for converters reviewing material compatibility to not only ensure product bonding success, but also speed up the quoting process.

Current global demand for pressure-sensitive adhesives is valued at approximately USD \$52 Billion or roughly 47 billion square meters per year and is expected to grow to USD \$73.5 Billion by 2024<sup>1</sup>. To give you some perspective on those numbers, 47 billion square meters is over 18,000 square miles of tape or enough tape to cover the entire state of New Jersey more than twice! Within those billions, there are infinite combinations available of adhesives and substrates. Both Armacell and Avery Dennison understand that converters don't have the time or resources to test all the combinations of foam and adhesives that exist, yet quickly quoting a job with confidence could be the deciding factor when it comes to winning orders from OEM and materials manufacturers. As a leader in materials science, Avery Dennison Performance Tapes released comprehensive bonding study in collaboration with Armacell. This study is the fourth in a series of bonding studies which aims to make it easier for converters to evaluate the performance of adhesive products with foams and other commonly used materials. This newest

study classified and defined the performance of Avery Dennison Core Series™ Portfolio adhesives when used with Armacell's Component Foam products primarily used in aerospace, automotive, building and construction, industrial, medical, packaging and sport/leisure segments.

“We're pleased to work with Avery Dennison and provide this resource for our customers,” said Isabel Wright, Senior Technical Manager, Armacell. “Over sixty years of foam innovation enables us to design optimized cell structures and densities for specific physical properties, custom engineered to customer needs. This study further emphasizes our commitment to meeting our customers' changing demands.” By utilizing this study in conjunction with the Avery Dennison Core Series Product Selection Tool, converters can now have a simple way to evaluate bonding strength along with other application requirements to quickly select the right adhesive for their unique application.



<sup>1</sup> <https://tombrowninc.com/blog/brief-history-pressure-sensitive-adhesives/>



## Fun Fact

Did you know that adhesive tape made its first appearance in

**1845?**

A surgeon named Dr. Horace Day used a rubber adhesive, pine gum, and turpentine mixture applied to fabric to make a new invention of surgical tape for his patient's care.

### THE SCIENCE BEHIND THE STUDY

Completing a bonding study under controlled conditions is paramount when expecting proven scientific results. Let's review the science behind this comprehensive study. Not only is foam bonding affected by the foam's base polymer, it can also be affected by its thickness and cell type. Adhesion to foam is affected by features such as adhesive mass, pressure, compression, lamination speed, and temperature. All of these factors were taken into consideration during the study performed with Armacell at the Avery Dennison Performance Tapes Painesville Innovation Center, which is an ISO 17025-certified facility that can test under a variety of real-world conditions. "Our goal with this study is to leverage our technical experts and

world-class testing facilities to simplify our customers' adhesive selection process," said Deanne Lewis, general industrial product manager at Avery Dennison Performance Tapes. "Armacell is a leader in expanded foams, and using this study, converters can efficiently and accurately specify adhesives for Armacell's innovative products."

#### Study Specific Conditions:

- Adhesive products were backed with a 2 mil PET film and trimmed to a one-inch width.
- Two sample sets were laminated to Armacell's elastomeric and polyolefin high-performance component foam products EnsoLite®, Monarch®, and OleTex®.
- All samples were tested at 180° Peel Adhesion at 12 in/min.

### FOUR QUESTIONS TO HELP DETERMINE THE CORRECT ADHESIVE SOLUTION

1. What type of material will you be laminating to? Some common substrates include foams, fibrous nonwovens, felts, fabrics, films, or foils.
2. What is the surface energy of the substrate the laminated part is adhering to? The types of surface energy options are high, medium, low, and extra low.
3. Are there any other end use application requirements? Some considerations are temperature resistance, humidity resistance, solvent or chemical resistance, or UV resistance
4. What tape construction is needed? Choosing the construction and liner combination that is suited for the application based on the bonding study.

What is the number one cause of adhesive failure? Undoubtedly it is choosing the incorrect type of adhesive for an application. Selecting an adhesive that cannot bond to particular substrates can cause issues such as reduced adhesive strength, loss of adhesion over time, bubbling caused by outgassing of foams, and even separation due to chemical incompatibility. Often adhesives are bonding to two very





dissimilar substrates so understanding what types of materials being used takes the guesswork out of the process.

Understanding what the part will be bonding to is equally important. Most adhesives will bond well to high surface energy but as the surface energy drops lower fewer adhesives will properly adhere. Once a Converter determines what foam they are using for an application, they can use the bonding study to narrow down the adhesive selection. It is important that a Converter also knows the surface energy of what a part will be bonding to in the end. Thirdly, considering any other end use or application requirements that the part will be subjected to should be identified. For example, will the part be in a high humidity or high temperature environment? Recognizing these end-use requirements will help avoid adhesive failure. Choosing an adhesive in the "best" category will be the most

compatible with a foam substrate likely achieving foam tear after bonding, meaning the bond is stronger than the foam itself.

Lastly, converters need to determine the final construction outcome of the product. If the adhesive is bonding to porous foam, then likely there will be need for a transfer tape that can be immersed into the foam. These are all simple examples of many of the questions converters will need to have answered by their customers to ensure ease of use for their customers. Also, since adhesives can be the more expensive element of a PSA foam part; it seems prudent to do the homework to ensure that you don't waste adhesive in trials. When the correct information is gathered from the customer and these queries have been understood, then the right combination choice for a successful application can be chosen with a high level of confidence.






























### **AVOID GETTING STUCK WITH THE WRONG ADHESIVE**

The Core Series Product Selection Tool is designed to streamline an adhesive and construction selection process. The tool will help walk converters through the information gathering process by following four simple steps that assist in determining the correct adhesive for an application. Avery Dennison offers 10 different adhesive chemistries, and multiple construction options that are aimed to cover 80% of converter's application needs.

Armacell and Avery Dennison Performance Tapes' collaboration on this bonding study and subsequent reference guide make doing business with our companies easier as we've done the testing and research so you don't have to. ■

[Click here to learn more about the Bonding Study.](#)



| Armacell Monarch Product Line  | Avery Dennison Adhesive Families   | Avery Dennison Product Numbers                           | Performance with Armacell Component Foams Materials |
|--|--|--|---|
| <ul style="list-style-type: none"> <li>• 5013</li> <li>• 5031</li> <li>• 3091</li> <li>• 8001</li> <li>• 9011</li> </ul>                     |  High Shear Acrylic / High Shear Rubber       | FT 8392  | Good  |
|  |  High Shear Rubber                            | FT 8345  | Better  |
|  |  Low VOC Acrylic                              | FBA 1118 GL<br>FBA 7918 GL<br>FBA 8218 GL<br>FBA 8318 GL | Better<br>Better<br>Better<br>Better                |
|  |  High Performance Low VOC Acrylic             | FT 1149 X<br>FT 8270                                     | Better<br>Better                                    |
|  |  General Purpose Acrylic                      | FT 1123  | Better  |
|  |  Pure Acrylic                                 | FBA 1115<br>FBA 8315                                     | Better<br>Better                                    |
|  |  LSE Modified Acrylic                         | FT 1943 PP   | Better  |
|  |  General Purpose Rubber                       | FBR 1950<br>FBR 8950                                     | Best<br>Best  |
|  |  General Purpose Rubber / High Shear Rubber   | FT 8327  | Best  |
|  General Purpose Acrylic                                    | FT 1126  | Best   |   |
| Armacell EnsoLite Product Line   | Avery Dennison Adhesive Families   | Avery Dennison Product Numbers                           | Performance with Armacell Component Foams Materials |
| <ul style="list-style-type: none"> <li>• IG1</li> <li>• IG3</li> <li>• IU0</li> <li>• MLC-Black</li> <li>• ECF 400</li> </ul>                |  High Shear Acrylic / High Shear Rubber       | FT 8392  | Good  |
|  |  General Purpose Rubber                       | FBR 1950<br>FBR 8950                                     | Better<br>Better                                    |
|  |  Low VOC Acrylic                              | FBA 1118 GL<br>FBA 7918 GL<br>FBA 8218 GL<br>FBA 8318 GL | Better<br>Better<br>Better<br>Better                |
|  |  General Purpose Acrylic                    | FT 1126  | Better  |
|  |  LSE Modified Acrylic                       | FT 1943 P  | Better  |
|  |  High Shear Rubber                          | FT 8345  | Best  |
|  |  High Performance Low VOC Acrylic           | FT 1149 X<br>FT 8270                                     | Best<br>Best  |
|  |  Pure Acrylic                               | FBA 1115<br>FBA 8315                                     | Best<br>Best  |
|  |  General Purpose Rubber / High Shear Rubber | FT 8327  | Best<br>Best  |
| Armacell OleTex Product Line   | Avery Dennison Adhesive Families   | Avery Dennison Product Numbers                           | Performance with Armacell Component Foams Materials |
| <ul style="list-style-type: none"> <li>• BDJN 200</li> <li>• BKJN 200</li> <li>• CDJN 400</li> <li>• CKJT 550</li> <li>• CKJN 200</li> </ul> |  High Performance Low VOC Acrylic           | FT 8270  | Good  |
|  |  Pure Acrylic                               | FBA 1115<br>FBA 8315                                     | Good<br>Good  |
|  |  LSE Modified Acrylic                       | FT 1943 PP   | Good  |
|  |  General Purpose Rubber / High Shear Rubber | FT 8327  | Good  |
|  |  High Shear Rubber                          | FT 8345  | Better  |
|  |  Low VOC Acrylic                            | FBA 1118 GL<br>FBA 7918 GL<br>FBA 8218 GL<br>FBA 8318 GL | Better<br>Better<br>Better<br>Better                |
|  |  General Purpose Rubber                     | FBR 1950<br>FBR 8950                                     | Best<br>Best  |
|  |  High Performance Low VOC Acrylic           | FT 1149 X  | Best  |
|  |  General Purpose Acrylic                    | FT 1123<br>FT 1126                                       | Best<br>Best  |

**Good** = Likely to achieve foam tear with heated lamination.

**Better** = May achieve foam tear without heat lamination.

**Best** = Likely to achieve foam tear at room temperature.

All data and technical information are based on results achieved under the specific conditions defined according to the testing standards referenced. Despite taking every precaution to ensure that said data and technical information are up to date, Armacell does not make any representation or warranty, express or implied, as to the accuracy, content or completeness of said data and technical information. Armacell also does not assume any liability towards any person resulting from the use of said data or technical information. Armacell reserves the right to revoke, modify or amend this document at any moment. It is the customer's responsibility to verify if the product is suitable for the intended application. The responsibility for professional and correct installation and compliance with relevant building regulations lies with the customer. This document does not constitute nor is part of a legal offer to sell or to contract.

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## ABOUT ARMACELL

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As the inventors of flexible foam for equipment insulation and a leading provider of engineered foams, Armacell develops innovative and safe thermal, acoustic and mechanical solutions that create sustainable value for its customers. Armacell's products significantly contribute to global energy efficiency making a difference around the world every day. With 3,000 employees and 23 production plants in 15 countries, the company operates two main businesses, Advanced Insulation and Engineered Foams. Armacell focuses on insulation materials for technical equipment, high-performance foams for high-tech and lightweight applications and next generation aerogel blanket technology.

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