Avery Dennison
Performance Tapes
EPDM Applications

Europe
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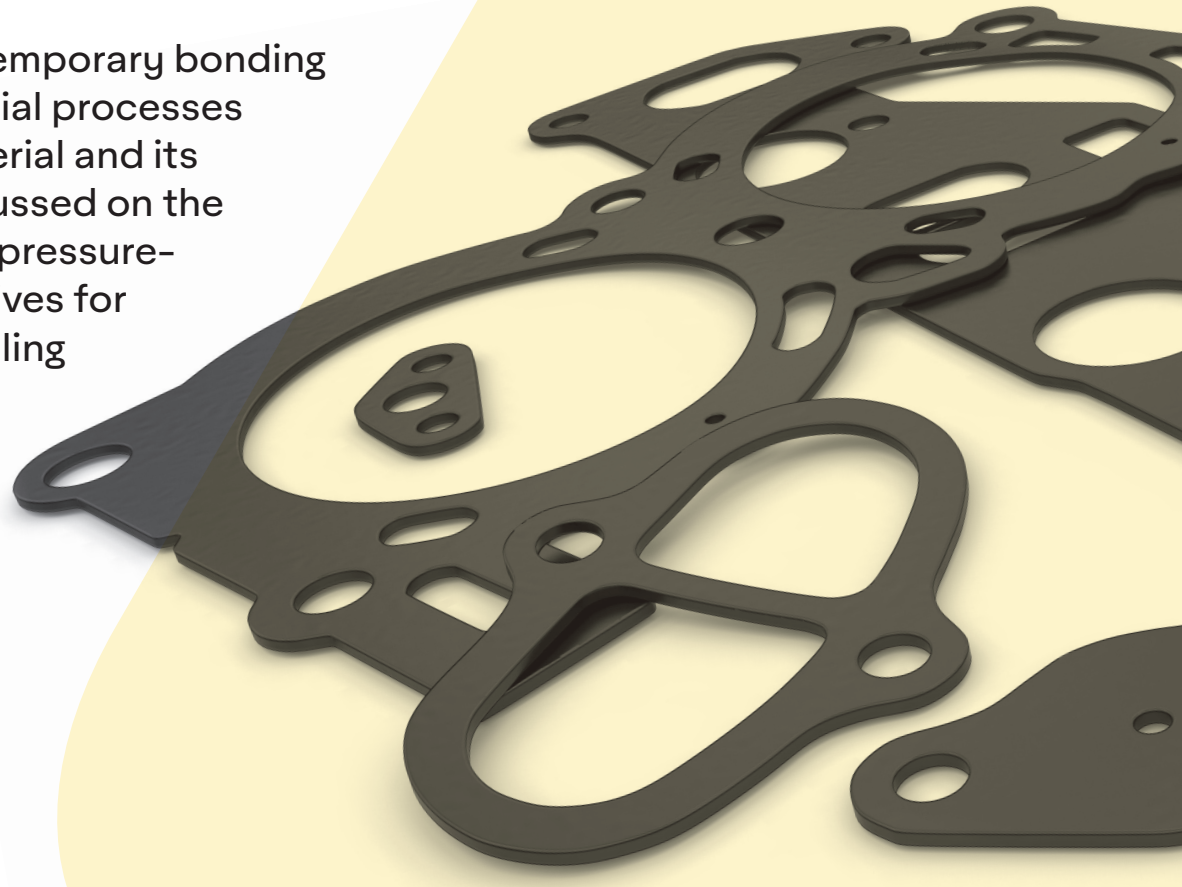
Reliable Bonding of EPDM* with PSA** Tapes

A guide to contemporary bonding needs in industrial processes with EPDM material and its derivatives, focussed on the lamination with pressure-sensitive adhesives for exterior and sealing applications



*Ethylene-Propylene-Diene-Monomer
**Pressure-Sensitive Adhesives

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Introduction

EPDM in foam, molded or sheet form, is finding its way to ever more industrial applications. EPDM is a non-toxic, synthetic type of rubber that has gained widespread popularity for its excellent durability, great resistance and chemical compatibility properties in the industry.

Besides the fact that EPDM rubber is one of the most waterproof rubbers available in the market, the material is also renowned for its excellent resistance to ozone, weather conditions, UV rays, and aging, making it a prime material for exterior applications.

This durability explains the rise in performance and market growth we witness. However, when it comes to bonding this material, many challenges still exist, especially when a bond needs to be achieved that is as durable as the material itself. When determining the bonding method, a few considerations need to be made, that we will be looking into in this brochure.

Increased industrial applications

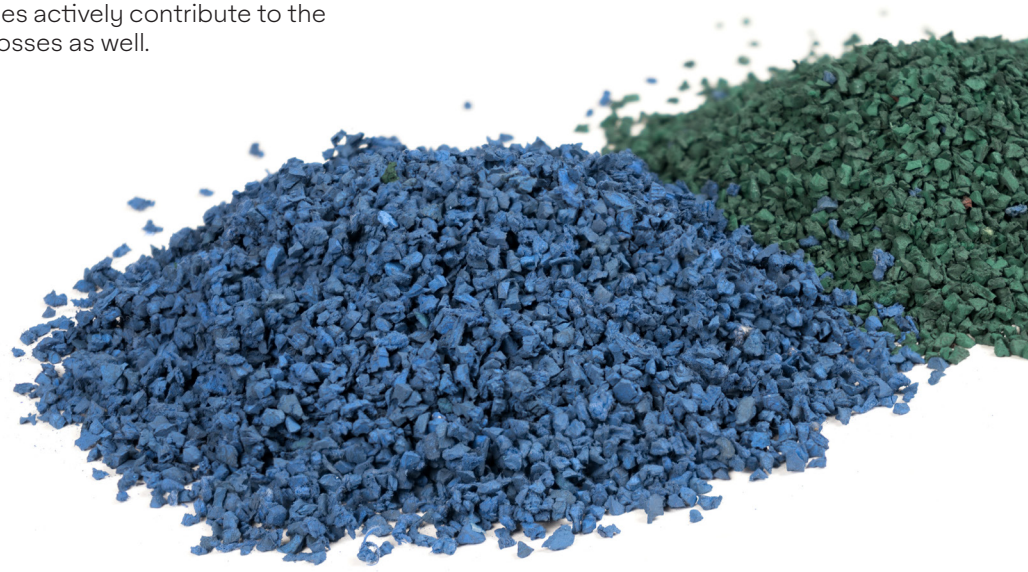
The market need to industrialize production steps has proven that EPDM material lends itself to innovation and applications that push the boundaries of its performance. A key element is the seemingly unlimited variety of shapes and forms the material can be processed into for applications in an increasing variety of products. Whether applied to sealing joints or absorb shocks, the material is processed starting from foam- and sheet formats, available in many different densities and converted to the exact mechanical needs it requires to perform. Its ability to strengthen its soft nature through vulcanization and giving it more rigid properties is often welcomed by the users as well.

An extruded custom EPMD profile

Sustainable lifetime

Besides its thermally insulating characteristics, and its ability to be recycled into rubber granules, an important sustainable element of EPDM, is its ever-praised resistance to the elements (UV, moisture, heat, cold, wind,...) and time. With its long lifetime of over 50 years, the material is delivering many sustainability goals, making certain structures more durable and thus increasing the lifetime of products or structures it is being applied to.

On top of that, EPDM's sealing properties actively contribute to the prevention of many energy & product losses as well.



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Upsides & Downsides of using EPDM

One example that proves the material's great durability is its application as a seal on large surfaces on wind turbines. An application like this makes maximum use of some of EPDM's properties like high elasticity (up to 400%) as well as an extended temperature resistance: from −40 °C to up to +120 °C. Key for this application are of course also the environmental influences, including ozone and UV radiation, which it needs to withstand during an expected lifetime of 50 years.

EPDM, or "Ethylene-Propylene-Diene-Monomer," is produced in sheet, roll and foam format, where the foam is the result of a molding in foam blocks and then slicing. The material is produced in many different variants depending on the monomer content in its composition. The high variety of components & compounds used in its fabrication form a first challenge in its handling and application further down the value chain.

Some of these residual components & compounds have the tendency to migrate from the material, which can have an effect on adjacent materials. It is important that such materials laminated to EPDM, such as adhesives, are capable of withstanding this effect.

EPDM material is often applied as a seal, or to accommodate movement where flexibility and elasticity is needed. Depending on the end application, a material variant with an open - or closed cell is then selected. Closed cell EPDM are great for sealing and fluid resistance, whereas the open cell variants are more flexible and conformable and used in shock - and sound absorption. This is just one selection criteria amongst a variety of material specifications that have an influence on the targeted behavior. Selecting the right grade is therefore not an easy task.

Bonding of EPDM

When selecting an EPDM grade, often the bonding need is of prime concern for the end qualification and selection. Overcoming durability challenges in aging is one of the key aspects to be successful in many temperature and climate chamber testing, applied to constructions for exterior or industrial applications.

Today, there is a wide variety of pressure-sensitive bonding solutions available, but to get qualified as long lasting, they primarily have to cope with some of the key challenges when bonding to EPDM.

A major concern for the adhesive selection is the resistance to some of the migrating substances that will occur over time. The impact of such substances on adhesives can be devastating: even an initially secure looking bond risks delamination over time as plasticizers and other compounds erode the adhesive bonding strength.

In many cases, the first line of defense is to apply a rubber adhesive with the capability of "absorbing" some of the migrating substances, thus safeguarding the bond. This absorption capability of the rubber material enables the resins, incorporated in the coated adhesive, to keep their functionality and hence stabilizing the bond over time. This beneficial aspect for the aging performance of an EPDM with an applied tape, can often compensate for other desired adhesive specifications like heat resistance in order to deliver the desired longevity of the bond. So If the circumstances do not require a temperature resistance higher than 115°C, or lower than -40° C, this absorption characteristic makes a rubber based adhesive the better choice when evaluating the aging properties on the laminating side, adjacent to the EPDM material.

However, should the substrate of the mounting side require the selection of an acrylic adhesive, which do not possess such resistance against migrating substances, a second line of defense can be in the form of a physical barrier incorporated in the bonding solution that prevents the migration reaching certain key elements. Elastic Polyester or Polypropylene films that form the carrier in a double coated construction can protect the mounting side of a construction. The result is a differential, double coated construction with a physical barrier (one side coated with rubber adhesive, the other with acrylic), which may be the preferred solution to bring a satisfying and long lasting result.

An alternative feature in the PSA construction may be a functional scrim made from polyester or more durable glass fiber which, when laminated to any foam, prevents foam stretching or deformation during application. As many foams have the tendency to return to their original state and will then risk being debonded, a scrim is a useful tool to limit any stretching during installation.

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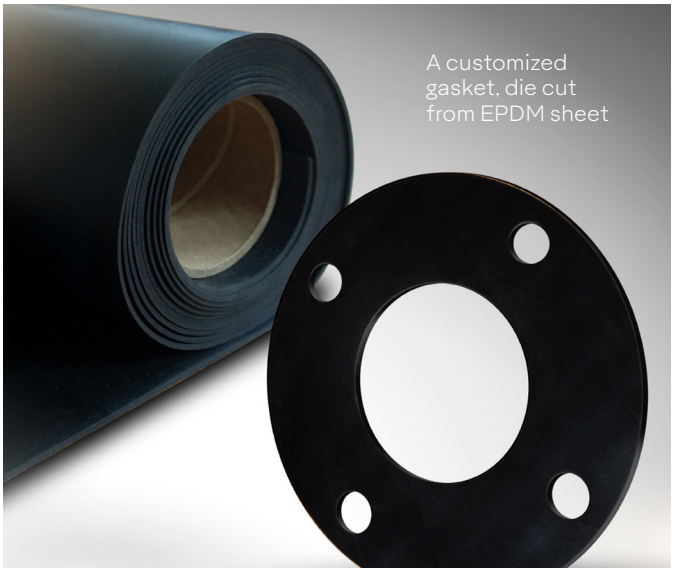
Resin from yellow rubber wood applied in adhesives.

Often an application with EPDM requires a constant adhesion level in order to achieve a proven and/or certified performance. The constant thickness of engineered adhesive tapes, from low to high coatweights, can deliver the constant adhesive layer thickness that is required for a reliable application. Such reliability gives greater certainty of a consistent performance that is sometimes hard to achieve with liquid applied glues. In addition, the absence of any residual solvent when bonding with tapes is a well known advantage in safeguarding the health and safety of technicians who bond and handle EPDM every day.

Avery Dennison Performance tapes has over many years developed several rubber based adhesive formulations from latex-free synthetic rubbers, with synthetic and/or natural resins. Some variants are designed for an increased resistance to the migration of substances, others have an improved heat resistance up to 115° C.

The adhesives are known for their great initial tack, high moisture and water resistance and excellent adhesion to low surface energy materials like many plastics. This compatibility with low surface energy surfaces is beneficial for the bonding with EPMD, which shows similar bonding behavior as some of the plastics.

EPDM seals used in a rain gutter joint



A customized gasket, die cut from EPDM sheet

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Avery Dennison EPDM Product Overview

Code	Type	Carrier	Adhesive 1	Permanent / Removable	Adhesive 2	Permanent/ Removable	Liner	Coat weight	Thickness w/o liner (µ)
FT 107	Transfer	N/A	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	Mid	60
FT 117	Transfer	N/A	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	Mid	60
FT 2147	Transfer	N/A	High Adhesion Rubber	Permanent	N/A	N/A	PP	Mid	60
FT 21081	Transfer	N/A	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	High	86
FT Y6663	Double Coated	Polyester scrim	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	High	220
FT 666	Double Coated	Polyester scrim	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	High	180
FT 660	Double Coated	Glass fiber scrim + polyester film laminate	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	High	185
FT 7983	Double Coated	Glass Fiber scrim	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	High	144
FT 7984	Double Coated	Glass Fiber scrim	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	High	165
FT 674	Double Coated	Glass Fiber scrim	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	High	195
FT 7358	Double Coated	12µ PET film	High Adhesion Rubber	Permanent	Low VOC Acrylic	Semi-Removable	Glassine	Mid	82
FT 7376	Double Coated	12µ PET film	High Adhesion Rubber	Permanent	High Shear Rubber	Semi-Removable	Glassine	High	100
FT 7387	Double Coated	12µ PET film	High Adhesion Rubber	Permanent	Pure Acrylic	Semi-Removable	Glassine	Mid	82
FT 310	Double Coated	12µ PET film	High Adhesion Rubber	Permanent	Pure Acrylic	Removable	Glassine	Low	68.5
FT 351	Double Coated	12µ PET film	High Adhesion Rubber	Permanent	Pure Acrylic	Permanent	Glassine	Mid	92
FT 306A	Double Coated	15µ PP film	High Adhesion Rubber	Permanent	High Adhesion Rubber	Permanent	Glassine	Mid	86.5
FT 273	Double Coated	44µ Nonwoven	High Adhesion Rubber	Permanent	N/A	N/A	Glassine	High	115
FT Y2201	Double Coated	40µ Tissue	High Adhesion Rubber		N/A	N/A	Glassine	Mid	102

Overview of a variety of PSA bonding solutions for EPDM: Transfer tapes, double coated tapes with functional scrim, and double coated tapes with integrated carrier used as physical barrier.

Applications with PSAs

Weather strips or seals are EPDM foams applied to seal gaps around window and door frames. When applied, they stop the airflow through these gaps, preventing drafts and keeping conditioned air inside. They are used at installation or during maintenance. Weather strips require double coated rubber-based adhesive scrim tapes with excellent weather and plasticizer resistance. The scrim prevents stretching of the foam during application (foam returns to its original state) and the rubber adhesives are capable of long term resistance to plasticizer migration from the foam.

Joint seals on exterior wall cladding. Weather resistant and self-adhesive EPDM strips are installed at the edge of facade panels to absorb minor tolerances in the structure. They also seal off the structure from ingress of dirt and water, guiding the flow of rain to the outside of the building envelope.

Seals in HVAC applications or in appliances and industrial installations. Various shapes and sizes are used as fluid seals in valves, taps, flanges, and other plumbing. As a positioning and application aid, they are made self-adhesive with PSA's. Tapes are also crucial when attachment to low surface energy surfaces is needed.

Various shock and sound absorption pads, as well as spacer profiles that are capable of accommodating tolerance differences and damping vibrations.

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For more information on our bonding tapes and adhesive solutions, call us:

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