

ARNITEL® VT



New Arnitel Vapour Transmission (VT) Product Portfolio Combines Intelligent Breathability with Cost-Efficient Processing for Film Applications

Arnitel Thermoplastic Elastomer (TPE-E) introduces a new breakthrough technology for a broad range of film applications including medical transdermal patches, building and construction membranes, sportswear, rainwear, other protective clothing, and footwear. The new Arnitel Vapour Transmission (VT) offers a unique product portfolio that combines intelligent breathability with cost-efficient processing.

- Outstanding breathability
- Performance and processing advantages
- Flexible processing for flexible design

New alternatives for multiple applications with Arnitel VT

Breathable films have for years offered benefits to a broad range of application areas, including medical, construction, and sportswear. Until recently, most films relied on micro pores or perforations to make them waterproof yet permeable to gases and moisture.

New breathable Arnitel VT portfolio is a breakthrough advance that eliminates the need for perforations or micro pores. The result is a material that combines excellent breathability with an uncompromising barrier to unwanted moisture.

Applications of the new grade VT 3108 are in consumer goods like outdoor wear and shoes where high breathability and comfort is important. In roofing

membrane applications the VT 3108 grade has proven to be complying with the latest European norms EN13859. The VT 3104 is now successfully applied in medical gown applications. The membrane protects the patient as well as the medical staff against micro-organisms and blood while simultaneously providing breathability and comfort.



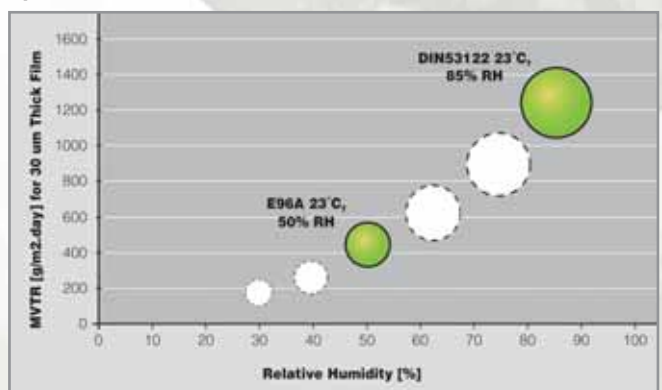
Arnitel VT offers intelligent breathability

Arnitel VT products can regulate the Moisture Vapor Transmission Rate (MVTR) intelligently. At low Relative Humidity the membrane dries out and shows a low MVTR. This can be as low as 10% of the maximum values. This means no excessive drying when it is not needed. At high Relative Humidity the MVTR goes up to the high values

There are several advantages of intelligent breathability of Arnitel VT for applications. In **roofing membranes** there is no shrinkage in wooden constructions in the roofing, or a too dry atmosphere in the building. Only when the Relative Humidity goes up and risk of condensation (wood rot, mold) occurs does the membrane start to breathe.

In **textile applications** there is no excessive cooling of the person due to evaporation. Only when the person heats up and the Relative Humidity in the jacket goes up will the membrane will start to breathe.

Figure 1 Intelligent Breathability - when the Relative Humidity goes up, the membrane will start to breathe.



Performance and processing advantages

Arnitel VT offers several performance and processing advantages over competitive materials, particularly microporous and thermoplastic polyurethane (TPU) films. The list of benefits is long and includes:

- Excellent permeability to water vapour, coupled with low moisture absorption
- Waterproof performance, high inlet pressure (>10 m water column) compared to microporous systems
- Good colorability
- Outstanding mechanical properties
- Resistance to chemicals during washing and weathering
- Flexibility also at cold temperatures (-30°C)
- Excellent high heat capability during lamination and in the drying cycles of commercial and consumer laundering processes (melt temperature 185°C)
- Stable in all sterilization technologies and processes
- Flexible processing options

These and other benefits arise from the monolithic structure of Arnitel VT film, which enables the delivery of superior barriers to blood borne pathogens (ASTM 1671 class IV capable), water droplets and micro-organisms better than microporous alternatives.

Versus microporous films

Monolithic Arnitel films provide much better barriers to blood, water droplets and micro-organisms than microporous alternatives. Microporous films provide channels for water or vapor to flow via diffusion. In general, this makes simple microporous films much more permeable to liquid water than monolithic films. Furthermore, the presence of small amounts of surfactants or soaps or anything that can change the surface tension characteristics of water can have a disastrous effect on the barrier properties of microporous and perforated films. Not so for films made from Arnitel TPE-E.

Figure 2 Moisture transmission through a monolithic Arnitel membrane.

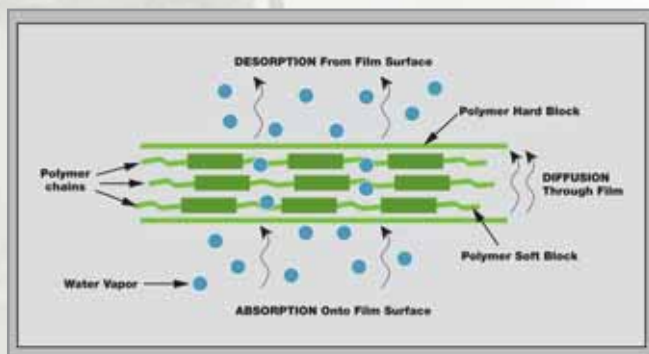
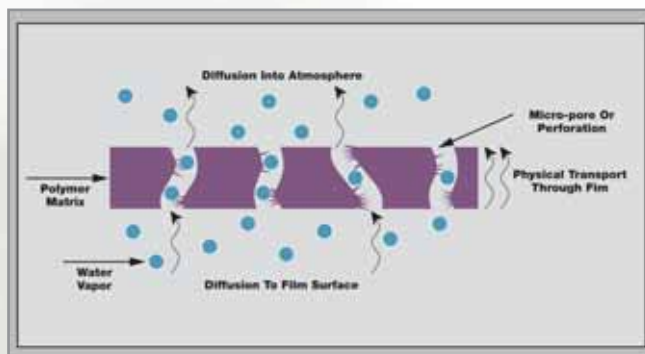


Figure 3 Moisture transport through a microporous or perforated film.





Versus TPU films

TPU materials offer another alternative to microporous and perforated films. However, compared to TPU films, Arnitel TPE-E material offers easier processing thanks to its higher melt strength and more favorable rheology leading to lower waste figures. Furthermore Arnitel does not need carrier membrane during processing. High heat resistance property of Arnitel also adds to its ability to withstand sterilization and washing.

The Arnitel VT difference

Arnitel VT 3108 is performing at the highest level of breathability for monolithic systems as shown in figure 4. Ret values of membranes are independently measured at the Hohenstein Institute according to the sweating hot plate model. When the Ret is higher than 20 Pa m²/W the breathability is generally insufficient for textile applications. Ret values lower than 6 will make the laminate suitable for high performance sportswear. The advantage of TPE-E is not breathability alone, but its combination with other specific properties. These include enhanced UV stability, improved resistance to heat or chemicals, and flexibility. New Arnitel VT products offer processing qualities such as optimized rheology for cast film production. This neck-in behavior is tested and optimized on lab equipment as shown in Figure 5. The new optimized VT grades not only show better neck in figures in lab conditions but have directly led to a waste reduction at several customers up to 50% of the original values.

Figure 4 Arnitel VT 3108 is performing at the highest level of breathability for monolithic systems.

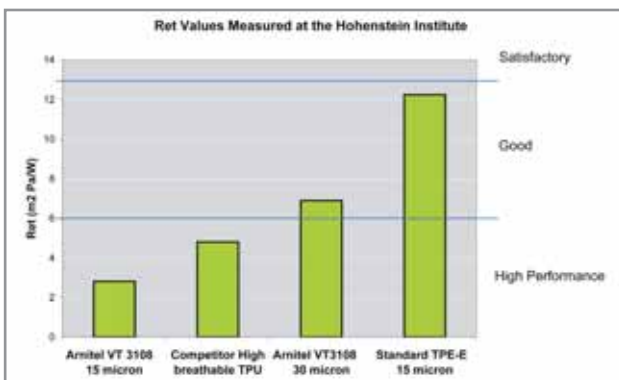
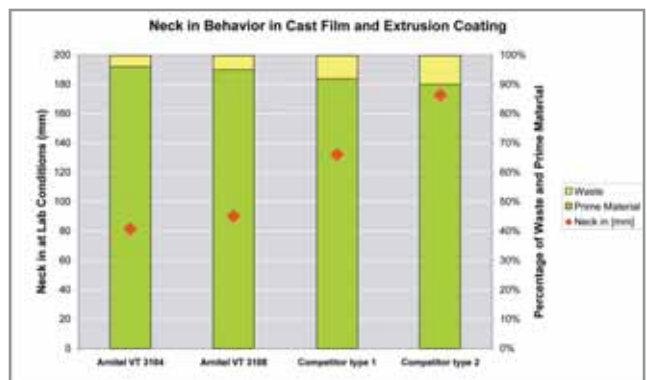


Figure 5 Optimized rheology leading to lower waste up to 50% due to neck-in improvement.



Arnitel VT grades have directly led to a waste reduction at several customers up to 50% of the original values.

Flexible processing for flexible design

Arnitel VT can typically be processed like any thermoplastic polymer through either direct or extrusion coating, casting, or blown film production. The material is easily processable on a standard three zone, single screw extruder. Its melt viscosity and behavior may also be easily adjusted to the processing equipment.

In direct coating processes, a flat die is used to extrude polymer directly onto the substrate, which can be a non-woven, a textile or even paper. This single-step process avoids the additional step of laminating a film to a substrate.

Adhesion may be chemical when using compatible materials, but it can also employ mechanical entanglement, where the TPE-E melt impregnates the surface of the substrate, embedding fibers of the substrate in the polymer matrix. With mechanical adhesion it is even possible to get a good bonding between Arnitel and polyolefin non-wovens.

The direct coating principle can be used for two-ply as well as three-ply systems. For products that depend on mechanical adhesion, a low viscosity is particularly favourable, since this allows the polymer to flow into the substrate. Lastly, Arnitel can be processed down to 10 micrometers, offering a flexible, highly permeable film or coating. The lamination of Arnitel film to textiles can be done with standard TPU hot melt or moisture curing hot melts. This process gives outstanding results and the laminate will withstand repeated washing without problems.

Arnitel delivers outstanding breathability and more

- Permeability to water vapor, coupled with improved waterproof performance when compared to microporous films
- Higher melt strength and more favorable rheology when compared to TPU films leading to lower material consumption and no need of carrier membrane
- Resistance to surfactants, sterilization and washing

→ Viral barrier
→ Waterproof

→ Easy processing
→ UV-resistant

• Medical
• Textile

cross
chains

Absorption



Key properties of Arnitel VT

Arnitel VT 3108

- MVTR (E96BW-94, 38°C, 50% R.H., 30um thick film): 14200 g/m² day
- Melting point (ISO11357-1/-3): 185°C
- Melt Flow Index (230°C, 2.16 kg, ISO1133): 10 cm³/10min
- Density (ISO1183): 1250 kg/m³
- Elongation at break (measured on tensile bars according to ISO 527-1/-2): 215%

Arnitel VT 3104

- MVTR (E96BW-94, 38°C, 50% R.H., 30um thick film): 3900 g/m² day
- Melting point (ISO11357-1/-3): 212°C
- Melt Flow Index (230°C, 2.16 kg, ISO1133): 10 cm³/10min
- Density (ISO1183): 1160 kg/m³
- Elongation at break (measured on tensile bars according to ISO 527-1/-2): 200%

Product portfolio for film applications

VT range

- VT 3104: Highly breathable, extrusion coating and cast film grade, with optimized rheology
- VT 3108: Extremely breathable, extrusion coating and cast film grade, with optimized rheology

UV Masterbatch

- E1-UV
- E2-UV (roofing applications)

Classics Arnitel TPE-E film grades

- EM400: Standard grade also applicable for film applications
- EM402-L: UV stabilized grade for roofing applications.
- PL380: Low viscous extrusion grade coating grade, high breathability
- PM381: High viscous grade for blown film and cast film applications, high breathability

All information, advice and/or samples ("Information") are provided by or on behalf of DSM Engineering Plastics on an "as is" basis, without any further warranties as to the accuracy, usefulness, correctness or completeness thereof. Use of or reliance on such Information shall be for your own sole risk, account and responsibility and you will indemnify and hold DSM Engineering Plastics and its affiliates harmless from and against any and all damages or claims from third parties in respect of your receipt, use of or reliance on the Information.

The disclosure of Information shall not be construed as granting you a license or any other intellectual property rights relating to such Information. The obtaining of such license or rights shall be subject to separate negotiations.

Europe

The Netherlands

DSM Engineering Plastics
Poststraat 1
P.O. Box 43
6130 AA Sittard
Tel. +31 46 47 70075
Fax +31 46 47 70101

USA

North America

DSM Engineering Plastics
P.O. Box 3333
2267 West Mill Road
Evansville, IN 47732-3333
Tel. +1 812 435 7500
Fax +1 812 435 7702

Asia Pacific

DSM Engineering Plastics Asia Pacific
11F, The Headquarters Building
No. 168 Middle Xi Zang Road
Shanghai 200001
China
Tel. +86 21 6141 8188
Fax +86 21 6141 7010

DSM Engineering Plastics

www.dsmep.com - www.arnitel.com