

Breathable membranes are nothing new, and numerous companies have established reputations for producing high performance, durable membranes that offer the breathability required across the spectrum of physical activity. Therefore, although manufacturers were faced with a tough choice on which brand of waterproof breathable membrane to use in their apparel in terms of quality and price, there was no particular variation in the product itself, in terms of technology. The membranes available on the market were, in general, all textile composites that employ multiple membrane layers (i.e., TPU and PTFE/Teflon). However, a new product – Omniflex's Transport-brand films – recently arrived on the market, offering apparel manufacturers an alternative to multiple layered breathable membranes, and it seems that the industry is showing a great deal of interest in this 'new kid on the block' for several reasons.

Thinning out the field in breathability

What sets Omniflex Transport films apart from traditional breathable membranes on the market is that they only use a single layer of waterproof-breathable film rather than the multiple layers required in multiple-layer composites. The inherent durability of the Transport-brand polyurethane, copolyester or ether-amide film allows them to be used without the necessity of an additional protective liner, as is required when PTFE is used as the inner layer of a PTFE/TPU composite. This not only reduces the bulk and weight of a product, it makes garments more compressible than multi-membrane alternatives, and it reduces material costs – a vital consideration in the highly competitive market of today. Garment manufacturers seem to be finding the single layer laminate an appealing option as, according to Omniflex, increasing numbers of performance textile laminators and apparel manufacturers started using Transport-brand films in outerwear, gloves and footwear during 2005.

Bigger is not always better

In basic terms, to create a waterproof garment that is also breathable, allowing the wearer's perspiration vapour to escape, an apparel manufacturer will typically employ a textile composite. This composite is created by bonding a layer of waterproof-breathable film to a layer of fabric, or sandwiching a layer of film between two layers of fabric. The top fabric is normally the final outer layer of the garment, the bottom an inner lining material.

There are two basic types of waterproof-breathable composite which vary depending on



Images / charts: Omniflex

the type of film or coating technology employed: monolithic or microporous. Both can usually provide a solid barrier that physically repels rain or other liquids, preventing moisture from passing through the textile composite to the inside of the garment.

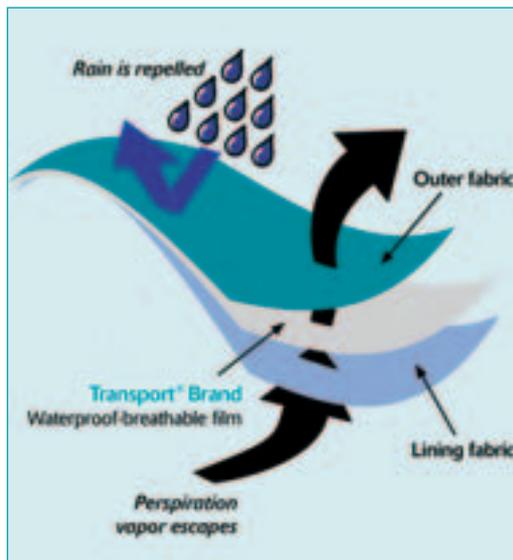
Microporous coatings and films – which are usually employed in multiple layer membranes - contain microscopic pores or capillaries that permit vapour to escape. These are hydrophobic i.e. the surface energy of the membrane causes it to inhibit the flow of liquid back through the capillaries into the garment due to the small size of the pores. The level of water repellency of this construction is dependent on a number of factors: the size of the pores; the pressure at which liquid is applied to the outer surface of the coating; and its resistance to contaminants, which can break down the membrane's surface energy.

Omniflex single layer films are monolithic, hydrophilic, and do not have pore capillaries or pinholes. The hydrophilic nature of the films makes them breathable, as they actively attract water vapour and absorb it through the inside face of the membrane. It is then 'transported' through the chemical matrix of the solid film to the outside surface via solid-state diffusion, where it evaporates upon exposure to the atmosphere.

Speed is of the essence

The amount of moisture and the speed with which it is able to move through the monolithic, hydrophilic membrane is directly related to the thickness of the film used in the construction: the thinner the film, the more moisture can be transported and diffused on the exterior of the composite.

Super-thin Transport films are cast on polyethylene, polyester and paper carriers in thicknesses as low as 0.2 mils (5 microns), thus maximising the moisture-vapour-transmission-rates of the textile composite in which they are used. They are extruded from a variety of grades of polyurethanes, copolyesters and ether-amides, depending on the hardness, elongation, moisture vapour transmission rates (MVTR) or other performance characteristics required for the garment and its end-use. Omniflex can extrude any of these three polymers into a solid, monolithic, hydrophilic membrane, maximising both breathability and water repellency. The result is high-performance lightweight apparel that keeps the wearer dry and comfortable in inclement weather.



How transport films work to keep the wearer dry and comfortable.

In addition to the choice of base polymer – thermoplastic polyurethane, copolyester and ether-amide – manufacturers can also specify a number of other options. Thickness can be specified from 0.2 to 6.0 mils (5-150 microns) for the best performing films, and in widths up to 68 inches (1.727metres). Mid-performance waterproof-breathable films are also available without a carrier in thicknesses of 0.8 mils (20 microns) or greater. All of the films can also be enhanced with antibacterial, antifungal and antistatic packages and are offered with gloss, smooth and matte surface finishes.

Furthermore, the MVTR of Transport films makes them well-suited for laminating to fabrics used in performance apparel and footwear applications, offering waterproofing and breathability. They also offer good drape, quietness, excellent stretch and recovery and their inherent adhesive properties provide durable bonds between the outer fabric layer and any inner lining material to which they are laminated.

It appears that this new lightweight product has sent out a clear message to the titans in the waterproof, breathable industry (and to the manufacturers who buy the products) – there is an alternative to multi layer membranes that works. This by no means marks the imminent demise of the big name products that have become household names, but there is a new product available that is changing opinions on single layer waterproofing and breathability, and is making everybody – including the competition – sit up and pay attention. 🌐

Typical physical properties

Transport Series	Film Type	Shore Hardness	Elongation	MVTR (1-mil film)
TX1500	Polyurethane	80A	600-700%	800 g/m ² /day
TX2000	Copolyester	45D	350-500%	725 g/m ² /day
TX4000	Ether-amide	40D	600-750%	775 g/m ² /day