

## Rethinking the **HUD** Toward augmented reality for head-up displays

**INSIDE STORY**  
GLASS LAMINATION  
FILM TECHNOLOGY



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# The Inside Story on Glass Lamination Film Technology for Tomorrow's Vehicles

**S**WM International has more than 30 years of experience developing and manufacturing high-performance extruded polyurethane films for a variety of markets. The company's leading glass lamination films, sold under the name Argotec™ Interlayer Films, were created for demanding applications in aerospace, automotive and building/construction markets.

In an interview with SAE's *Automotive Engineering*, Tom Niziolek, Commercial Director, Optical, explains the new, unique characteristics and benefits of Argotec™ Interlayer Films in automotive glazing.

**AE: Glass lamination-film technology has been around since the 1930s as a safety enhancement for automotive windshields, but talk about some of the recent innovations and applications for SWM's thermo-plastic polyurethane (TPU) lamination film that go beyond windshield glazing.**

**Niziolek:** Glass lamination technology has expanded far beyond windshields. Automotive designers and manufacturers now are looking for solutions to reduce cost, mitigate outside noise and improve aesthetics in all car glazing. SWM's TPU films are preferred in automotive glazing laminate applications particularly for panoramic roof systems and side windows because they are high-strength, lightweight and extremely transparent.

When it comes to strength, TPU interlayer film has a long history of being used in bullet resistant "armored" windows for vehicles because it is an excellent bonding agent for dissimilar materials such as glass and plastic. It also absorbs and diffuses energy from an impact, making vehicle glazing safer.

**AE: What are some of the advantages of TPU for glass lamination film compared with "more-traditional" polyvinyl butyral (PVB)?**

**Niziolek:** A key advantage of TPU compared to traditional lamination films is TPU's ability to bond to both glass and plastic surfaces; TPU is well-suited for bonding of dissimilar glazing layers like glass to polycarbonate, or acrylic or polyester. Also, TPU is a very stable and durable film across a wide range of temperatures—in a laminate, it will last through many years of UV exposure without any color change.

**AE: What are the changing requirements and potential future applications that you see for advanced glass-lamination technology? What else can these materials do?**



SWM International's Tom Niziolek, Commercial Director, Optical.

**Niziolek:** Manufacturers are using advanced glass-lamination technology to improve passenger comfort while simultaneously ensuring their safety. We are seeing a growing demand for efficient light filtration: TPU technology filters the UV spectrum while allowing natural light to pass through, in turn providing glare and heat reduction to passengers. Reducing outside noise also is a concern and TPU has exceptional sound-deadening properties that assist with decreasing road noise.

**AE: "Panoramic" sunroofs have become a common feature in passenger vehicles. Is TPU a good solution for these very large glass applications?**

**Niziolek:** TPU is a very good material choice to build highly impact-resistant, transparent and lightweight glazing composites for panoramic sunroofs. With the growth of transparent materials for head-up displays (HUDs), TPU is an enabler for HUDs and other high-tech vehicle features.

**AE: What should designers and engineers know about TPU lamination film when considering their options for glass applications? Can SWM be a design resource for them?**

**Niziolek:** TPU film is not only for armored windows; it is a premier option for making lightweight, impact-resistant glazing materials—and often where a layer of glass is being replaced by a clear plastic.

There is growth in designing "operator"-controlled vehicle switchable shading—not just dark-tinted glass, where TPU is very compatible with the liquid-crystal technology being used for these applications. SWM is a resource and material consultant and partner to aid in forward-thinking designs for vehicles. When it comes to custom engineering, we work directly with glazing designers and manufacturers to understand their requirements and create custom solutions using our advanced film technology. ■

# WHO IS SWM?

## Superior Window Materials

SWM provides engineered materials to a wide range of industries and applications. We are a leading supplier of high-strength thermoplastic polyurethane (TPU) films for laminated glazing composites for windows. Glass manufacturers for automotive, military and aerospace applications trust high-performance, lightweight Argotec™ interlayer films to create strong bonds with fewer deformities. Solutions today, engineered for tomorrow. Get to know SWM. You'll like what we're all about.

Argotec™  
Interlayer Films



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