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The Shape of Glass to Come: Q&A with Eastman

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How automotive glass is evolving into a multifunctional EV technology improving comfort, efficiency, acoustics, safety, and digital integration.

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For much of the car's history, glass was treated as little more than transparent shielding: a passive barrier between occupants and the elements. That conception is gradually disappearing. In the age of electric vehicles, automotive glazing is being recast as an active engineering platform — part climate-control system, part acoustic insulator, part structural member and part digital interface.

The shift reflects the changing priorities of modern mobility. Electric drivetrains, being quieter than combustion engines, expose previously masked wind and tire noise, pushing manufacturers to develop acoustic interlayers capable of damping specific high-frequency bands. Meanwhile, panoramic roofs and expansive greenhouse designs, popular in premium EVs, increase solar load and place greater demands on thermal management. Spectrally selective laminates now help reduce cabin heat gain, lowering heating, ventilation and air conditioning (HVAC) energy consumption and marginally extending driving range.

At the same time, glass is assuming new structural responsibilities. Frameless designs and flush exterior styling require laminated glazing systems that contribute to body rigidity while remaining thin and lightweight. The windshield must also accommodate augmented-reality head-up displays, advanced driver assistance system (ADAS) cameras and lidar systems without compromising optical precision or sensor fidelity.

To learn more, we spoke to Romain Delorme, Automotive Global Market Segment Manager, Advanced Interlayers, Eastman.

The following is an edited transcript of the conversation.

S&P Global Mobility: How is the industry evolving from single-function automotive glass to multifunctional laminated systems that simultaneously address acoustics, solar control, structural rigidity and optical performance?

Romain Delorme: Automotive glass has evolved from a passive safety component into a multifunctional system that simultaneously addresses acoustic comfort, heat management, structural performance and optical quality in a single laminated architecture. EVs and premium vehicles are the primary drivers of this shift, where cabin quietness, thermal comfort, lightweight design and styling are all critical requirements, alongside increasingly stringent optical standards set by original equipment manufacturers. The real trend is better integration of functions — either within a single layer or through multistack functional film integration — allowing automakers to balance performance, comfort and efficiency without compromise.

With EVs increasing greenhouse glass area, what are the key engineering trade-offs between solar load management, cabin comfort and vehicle range efficiency?

The rise of EVs has amplified a fundamental challenge: Larger panoramic roofs and bigger glazed areas mean larger thermal loads, while the elevated seating position — a result of the battery pack located along the floor pan — exposes occupants to more direct solar exposure. At the same time, consumers and designers expect seamless aesthetics alongside efficient cabin climate control, creating a genuine tension between design ambition and thermal performance. Managing this balance requires solar control solutions that can address thermal load, perceived cabin quality and aesthetics together rather than as separate considerations.

As powertrain noise disappears in EVs, how is the focus shifting toward high-frequency road and wind noise mitigation, and what material innovations are most effective in this frequency range?

Eliminating the internal combustion engine removes a major source of background noise that previously masked wind and road noise, making glazing a dominant noise-mitigation challenge in EV design. Modern EVs also tend to incorporate significantly larger glazing areas — such as large glass roofs — which provide greater transparency to aero-acoustic noise. OEMs are prioritizing enhanced acoustic damping at mid-to-high frequencies to improve passenger comfort and support voice-activated systems connected to ADAS functionality. Acoustic interlayer technologies directly address this, improving performance in the medium frequency range and delivering additional gains at higher frequencies compared to traditional interlayers.

To what extent is laminated glazing now being treated as part of the vehicle's structural and aerodynamic system rather than a passive enclosure component?

There is a growing trend in the automotive industry where premium OEMs are increasingly shifting toward flush exterior aesthetics — both in frameless front sidelite designs and in integrated glazing where the windshield, sunroof and backlite are designed to appear as one continuous piece of glass. Both approaches require the glazing to contribute to body rigidity without the support of a traditional frame, placing new and more demanding structural requirements on the glazing system and pushing interlayer technology to evolve beyond its traditional role. Weight reduction and structural enhancement are the two central value propositions driving this evolution.

How are material systems being engineered to reduce glass thickness and vehicle weight while maintaining stiffness, dimensional stability and crash performance requirements?

There is a clear industry trend, particularly among EV manufacturers, to reduce overall vehicle weight to improve energy efficiency and optimize driving range, and glazing systems represent a meaningful opportunity. The primary challenge lies in achieving thinner glass configurations while maintaining equivalent levels of acoustic performance and structural support.

How significant is the role of spectrally selective interlayers in reducing HVAC load, and how does this translate into measurable EV range improvements under real-world driving conditions?

In EV design, glazing is becoming larger, so spectrally selective interlayers play a meaningful role in reducing the thermal load on the cabin, which, in turn, reduces the demand on the HVAC system — a significant energy consumer in EVs.

What advances are being made in tuning interlayer materials to target specific noise frequency bands — particularly human voice and tire-road interaction frequencies?

Wind noise overlaps with critical frequency bands for speech intelligibility and voice recognition, negatively affecting real-world listening conditions and voice-command keyword detection. EV cabins also face strong discrete tonal noise from electric motors and power inverters — perceptually salient sounds that can be irritating even at low amplitudes in an otherwise quiet background. Acoustic interlayer technology has advanced to address these specific bands.

How are glazing materials being engineered to support emerging in-vehicle technologies such as head up displays (HUDs), AR windshields, and sensor integration without compromising optical or thermal performance?

As HUD projections evolve toward longer virtual image distances enabling larger field of views and augmented reality, the windshield must deliver increasingly precise optical behavior — controlling wedge angle and thickness uniformity to eliminate ghosting and supporting variable virtual image distances across different projection zones. Simultaneously, front-facing ADAS cameras require a clean transmitted image, and emerging lidar systems demand careful management of wavelength transparency to function accurately behind the glass. Solar-control and UV-blocking formulations address cabin comfort without compromising visibility or sensor performance. The result is a windshield that must balance safety, optical precision, sensor reliability and thermal comfort all at once.

As OEMs push for frameless designs, larger glass surfaces and dynamic lighting integration, how are material innovations enabling design flexibility without breaking traditional safety, noise, vibration and harshness (NVH), or durability limits?

In moveable frameless sidelite designs, stiffness requirements are critical to the functionality of door systems. When operating the car, there is no frame to compensate for any shortfall, amplifying the need for enhanced interlayer solutions that can deliver both structural performance and acoustic damping in a single construction.

Larger sunroof designs are increasingly being approached as integrated, multi-functional systems. As dynamic lighting integration becomes a growing design priority, the ability to integrate multiple functions — reduced thickness, UV protection, color and solar control — into a single interlayer is becoming a key enabler for both the integration and longevity of these systems.

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