Autonomous Driving is a Burgeoning Trend. But What Will Hold It Together?

Among all the trends that the automotive industry is leading – electrification, lightweighting, ride sharing, et al – perhaps the most spectacular is the trend toward autonomous vehicles. Somehow the idea of driverless cars zipping around at our beck and call exemplifies what we've always, at least unconsciously, associated with "the future."

Here's a good indicator of what "the future" means: a recent study by Research and Markets says that global autonomous vehicles market revenue is expected to grow at a CAGR of 39.6% in the decade beginning in 2017, and reach US $126.8 billion by 2027.

Another study, by Rethinkx), posits that "95% of U.S. passenger miles traveled will be served by on-demand autonomous electric vehicles owned by fleets, not individuals."

If that seems aggressive, we already know that some features of autonomous driving are already here. On the scale of one to five levels of autonomy developed by the Society of Automotive Engineers and published in 2014, many of today's vehicles have features that fit into levels 1 and 2, such as adaptive cruise control (ACC), autonomous braking and lane assist. Clearly, observers are counting on a big leap in the near term to vehicles that are operated almost completely by systems, not humans (levels 3 and 4).

Many industry efforts toward autonomous are extending beyond the groundbreaking experiments from companies such as Tesla, Waymo and Baidu. Early versions of automated vehicles (AVs) include the Mercedes Benz E-Class, which features integrated networks that connect vehicles to vehicles (which helps automated navigation in traffic) and vehicles to infrastructure, such as signs, traffic lights and lane markers. Volvo has the IntelliSafe Autopilot system, which adds features such as pedestrian and bicycle detection, high-beam control, and a 360-degree console display to ACC and lane assist functions. The Cadillac CT6 sedan features Super Cruise technology which enables automated steering, acceleration and braking during freeway driving.

The first thing that most people might think of on an autonomous vehicle is the equipment it uses to communicate with its surroundings – external sensors, video cameras, mapping devices and radar and lidar units.

Along with that, companies are exploring and testing devices installed in the environment around the vehicle. Known collectively as Vehicle-to-Infrastructure (V2I), these efforts include the development of machine-readable pavement marking and directional signage technology. These devices reflect light inside and outside of the visible spectrum. This makes road boundaries and typical traffic and highway signs visible to both drivers and on-board sensory devices in any conditions. An equally important initiative involves Dedicated Short Range Communication (DSRC) – wireless communication systems from vehicle to vehicle (V2V), designed to help vehicles temporarily identify and communicate with each

other. 3M, for example, is employing the DSRC Multi-Channel Test Tool, a 3rd-party multi-channel listening system, to help establish and meet developing industry standards for connected vehicles.

Even as technologies like these make the headlines, the interior of the vehicle is equally critical. Today's Motor Vehicles says that the average driver is estimated to have up to 50 minutes of free time as a passenger in an autonomous vehicle. Indeed, materials and design engineers are already working to completely revamp vehicle interiors. Recent automotive interior prototypes include features like touch controls integrated into dashboards and steering wheels. Thin, modular and hidden storage devices and designs, such as catchbins for cell phones, are already under development. This is to say nothing of the concept cars which major manufacturers are continually rolling out at auto shows worldwide. These concepts invariably feature what's being termed as a living room on wheels – circular couches, large screen infotainment, home-style furniture and, somehow, plenty of space.

Consider also that the American Automobile Association (AAA) recently released findings that say Americans spend an average of 17,600 minutes driving each year. All of this points to the distinct possibility that as autonomous vehicles become more commonplace and the novelty wears off, the interior of the vehicle could become even more important.

As materials and design engineers are aware, the ideal interior cabin experience is evolving. Creating it encompasses more than just the shapes of things. It also involves what materials will be used to render them. Concepts include haptic dashboard panels, carbon fiber trim wraps, seating materials that sense rider biometrics, gaze detection systems and anti-microbial door panels to name a few.

But there's much more to consider. If the plan by General Motors to release a 2019 fleet version of its Chevy Bolt is any indication, the steering wheel will begin to disappear. Even if major automakers do not make expanded wraparound LED screens and holograms viable for mass production, we can count on some type of increase in in-vehicle infotainment. Drivers, increasingly, will become passengers.

Virtually none of this will be possible without similar advancements in tapes and adhesives. Some of the challenges manufacturers face have to do with multi-materials – how can you reliably bond new and dissimilar substrates in a setting that demands stunning aesthetics as well as durability? Double-sided tapes are a viable solution today, and will likely become even more viable in the future. They feature differential adhesives formulated, for example, for bonding to a low-surface-energy plastic on one side and to metals or fabrics on the other. Just one application that is ideal for double-sided bonding is the latest in fixed and movable storage bins. Structural adhesives have been under continuous development as well, and are likely to become an excellent option for bonding multi-materials.

What will autonomous interiors sound like? The current role of acoustic insulation and absorption materials is already vital, especially for areas such as door cavities and headliners, for limiting road noise and other noise, vibration and harshness (NVH) inside the vehicle. This is especially important as the trend toward electrification continues to emerge. As the vehicle becomes quieter without a standard internal combustion engine, how can we manage road and pass-by noise in the cabin?

Manufacturers are also working to understand not just the level of sound, but also its perceived quality. What's the best environment for watching a movie? Having a group conversation? Holding a conference call? We'll likely find out soon.

At the same time, we should see new ideas in areas such as interior lighting and seating. This means added electronics, and heat – which generates the need for thermal management. Foil tapes, for example, can reflect heat in the short term, and spread heat over time to help dissipate it over a wider surface area, which is excellent for use around devices such as wire harnesses.

Whatever form autonomous vehicles take – and we're beginning to see it today – it's important to stay up-to-date.. As a manufacturer of tapes, adhesives and insulating materials for the automotive space, 3M maintains continuous research and development to meet the needs of OEM designers as well as Tier suppliers. For more information, visit our automotive interiors home page.

Sources:

http://www.todaysmotorvehicles.com/article/designing-interiors-for-autonomous-vehicles/

https://www.thehour.com/technology/businessinsider/article/The-future-of-self-driving-cars-hinges-on-one-12534459.php

https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/disruptive-trends-that-will-transform-the-auto-industry

http://id.worldpronews.com/81113/6230/117/bafe0cf4ba3a85221ded88e56a6e227b8ccbcde5

https://www.prnewswire.com/news-releases/1268-billion-autonomous-vehicle-market-global-drivers-restraints-opportunities-trends-and-forecasts-2017-2023-300486159.html

http://www.autonews.com/article/20151108/OEM03/311099977/7-innovations-in-auto-interiors

https://community.plm.automation.siemens.com/t5/Digital-Transformations/How-will-autonomous-cars-look-as-they-hit-the-road/ba-p/445930

http://newsroom.aaa.com/2016/09/americans-spend-average-17600-minutes-driving-year/

https://www.volvocars.com/us/about/our-innovations/intellisafe

https://www.3m.com/3M/en_US/bonding-and-assembly-us/composite-bonding/

http://media.gm.com/media/us/en/cadillac/news.detail.html/content/Pages/news/us/en/2017/apr/0410-supercruise.html

http://id.worldpronews.com/81113/6230/117/bafe0cf4ba3a85221ded88e56a6e227b8ccbcde5
https://www.daimler.com/innovation/case/connectivity/mbux-2.html

https://www.3m.com/3M/en_US/bonding-and-assembly-us/composite-bonding/

https://www.freep.com/story/money/cars/mark-phelan/2018/03/04/car-extension-your-brain/387973002/

Technical Information: The technical information, recommendations and other statements contained in this document are based upon tests or experience that 3M believes are reliable, but the accuracy or completeness of such information is not guaranteed.

Product Use: Many factors beyond 3M's control and uniquely within user's knowledge and control can affect the use and performance of a 3M product in a particular application Given the variety of factors that can affect the use and performance of a 3M product, user is solely responsible for evaluating the 3M product and determining whether it is fit for a particular purpose and suitable for user's method of application.

Warranty, Limited Remedy and Disclaimer: Unless an additional warranty is specifically stated on the applicable 3M product packaging or product literature, 3M warrants that each 3M product meets the applicable 3M product specification at the time 3M ships the product. 3M MAKES NO OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY IMPLIED WARRANTY OR CONDITION ARISING OUT OF A COURSE OF DEALING, CUSTOM OR USAGE OF TRADE. If the 3M product does not conform to this warranty, then the sole and exclusive remedy is, at 3M's option, replacement of the 3M product or refund of the purchase price.

Limitation of Liability: Except where prohibited by law, 3M will not be liable for any loss or damage arising from the 3M product, whether direct, indirect, special, incidental or consequential, regardless of the legal theory asserted, including warranty, contract, negligence or strict liability

© 3M 2018 All Rights Reserved.