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Design Considerations and the Future of Vehicles

Design flexibility is one of the biggest challenges facing automotive engineers. Not only do designs and components need to incorporate current regulations and customer needs, they need to be adaptable for what comes next. New materials may become available or the same material may be produced by a new process, either of which can change bonding needs. Adding new features such as touch screens or other displays can also alter the design, and altering the design can create new paths for noise to enter the interior, generating a need for new NVH solutions. This article discusses broad trends in automobile interior design and how they can impact design options.

Safety Features

Safety regulations are changing all the time, and so are the ways vehicle safety needs interact with other design challenges. For instance, new or thinner plastics that would make a vehicle lighter might also exhibit different properties in extreme temperatures, such as becoming brittle in the cold. This could affect their crashworthiness and thus becomes an important safety consideration.

Another intersection between safety and design is figuring out how safety features work with other components. Adding more display screens and trying to package them in the instrument panel can present particular challenges. They need to be placed where the viewer can see them comfortably, yet still allow other features like air bags to work, and the screens themselves also need to be safe in the event of a crash. Speakers and lights can present similar challenges around crashworthiness, but they can be placed out of the lines of likely impact.

Personalization

More and more customers don't want just any car, they want their own car. Customers have long been offered audio options such as entertainment packages, so connecting the vehicle with a smartphone was a logical extension that allowed the user to keep existing personalization such as music playlists. As cars become more connected to the internet this will expand, with either existing virtual assistants moving into the car or OEMs creating their own versions just for the vehicle. These types of electronic options are physically straightforward, but it's important to make sure different systems work together for a smooth customer experience.

Personalizing the interior appearance will also be increasingly important. Most buyers already have a choice of fabric colors, and LEDs with light pipes are making it possible to offer a choice of light colors controlled from the instrument panel. While large panel pieces are likely to be offered in a fairly limited selection, smaller pieces of trim that bond to those panels could offer a wider range of colors or patterns as another way to personalize the vehicle. These options can be combined to offer customers a truly personalized interior, and as the industry moves forward choice will likely become a differentiator between brands.

Autonomous Vehicles

Autonomous vehicles don't just affect the driver having to control the car, they also affect visibility and what the driver needs to see. As the car itself has more sensors to feed data to the computer, that same information can be conveyed to the driver through a Head-Up Display (HUD). This may increase the challenge of keeping everything outside visible while also presenting sensor information. As the driver becomes a rider for all or most of the ride, the driver space may be required to transform into an office or entertainment area, but with the ability to revert to a driver space at a moment's notice if necessary.

Bonding Lightweight Materials

The trend toward thinner, lighter materials will continue as OEMs strive to meet their fuel economy, regulatory and sustainability goals. Joining new materials can present challenges, especially bonding low surface energy plastics or adhering different materials to each other. Designing for new materials means finding a compromise between two paths: the need to specify the materials you want right now but also prepare for the possibility that a substrate might change in the future. Ideally the new substrate can be bonded the same way as the previous one, but it's important to validate this process early to ensure there are no delays during vehicle launch.

Sustainable Materials

As more and more customers factor sustainability and sourcing into their purchase decisions, different materials are coming into play. Sustainable materials can be incorporated in several different ways. One trend is to use natural products like wood or natural fibers, which might be grown specifically or sourced in a way to manage waste. Bamboo is another natural material that is strong, flexible and lightweight.

Another trend in sustainability is the use of plant-based materials to make plastics. For instance, soy-derived materials can replace some portion of petroleum-based polyol in the foam used for seats and armrests, with some formulations up to 40% soy. Another example is polylactic acid, a form of polyester derived from renewable resources such as corn, cassava or sugarcane. Incorporating these and other materials can help meet sustainability goals.

Acoustics

The trend toward quieter automotive interiors has been going on for a couple decades, but the reduced engine noise of electric cars and increasing electronic options mean it will accelerate. Passengers want the best ambience and experience whether they're listening to music, talking to each other or talking on a speakerphone, and the space must be designed with all of these in mind. Acoustic insulation can be shaped to assist with this while also reducing road and engine noise and other outside sounds. Active noise cancellation has proven challenging because it is very difficult to manage the constantly changing noise profiles in the cabin.

A related trend is controlling pass-by noise, or how much noise a vehicle introduces into the environment. While much pass-by noise control is related to tires or the engine, minimizing how much interior sound is transmitted outside the cabin is also a factor. Acoustic insulation works both ways so the same insulation does double duty, but controlling pass-by noise may affect how much insulation you specify or how it's shaped.

Lighting

Like acoustics, lighting can provide a very personalized customer experience. LEDs are becoming more popular for vehicles because they're lightweight, don't draw much power and generate very little heat. LEDs are used as the source for light pipes, which efficiently use a single light source to illuminate a

longer area while also providing ambience and a line of light rather than single dots. As noted earlier, multicolor LEDs allow the customer to choose or change colors. OLEDs (Organic Light-Emitting Diodes) are also an option, though currently their greater cost needs to be weighed against other factors such as greater flexibility.

3M is Here to Help

As you consider these trends and the challenges they present for automotive design, remember that you aren't alone. 3M has been meeting challenges for over a century and we have a world-class team of application engineers in place all around the globe. Our network of technical experts is ready to help you find a way to make your designs a reality.