OLED lighting for automotive: communicable and adaptive

John Holland, chief revenue officer (CRO) at OLEDWorks (Rochester, New York), describes how OLED lighting is meeting automotive demands

In a recent report by BIS Research, titled "Next Generation Automotive Lighting Market – A Global and Regional Analysis," the authors proposed that the success of automotive lighting solutions will depend on whether the solution is (1) communicable, (2) adaptive, (3) ambient, and (4) flexible.

1. It is communicable. OLEDs provide automakers the ability for their vehicles to communicate with cars and people through additional methods beyond LED, commonly referred to as "Car-to-X" communication. OLED lighting can communicate upcoming hazards and sudden changes in speed or road conditions.
2. It is adaptive. Headlamps and rear taillights have existed nearly as long as the automobile. They were very basic and served a singular function: increase night time visibility. OLEDs allow automakers to move past the vision of the early 1900s and allow forward-thinking automotive designers to accomplish new and extraordinary lighting objectives.
3. It is ambient. OLED ambient lighting in automotive interiors and exteriors is fast becoming a differentiator in many ways. Lighting in the interior impacts the space, driver experience and has a significant impact on night time driving. A well-equipped vehicle with ambient OLED lighting can reduce driver fatigue, keep the driver alert, and reduce glare, as well as many other benefits. Exterior areas such as branding and badging are an exciting areas for OLEDs.
4. It is flexible. Automotive designers are eager to take advantage of all the unique characteristics of OLED lighting and can soon take full advantage of OLEDs manufactured with flexible glass. OLED lighting is highly customisable, can project light in ways incandescent and LED lighting cannot, and allows for vastly improved aesthetics and distinctive options for design and brand differentiation. Now in a flexible form factor.

These four characteristics will revolutionise automotive lighting by transforming it from the basic objective of illumination to a state-of-the-art lighting experience that will enhance the aesthetics, design, utility, and overall safety of the vehicle. This increased safety will not only affect the vehicle's driver and passengers, but the safety of the surrounding drivers, pedestrians, cyclers, and even nearby smart cars with self-driving capabilities.

The automotive industry is changing - quickly

We are now discussing and looking at electric vehicles from hundreds of manufacturers large and small. Partial autonomous driving and adaptive cruise control are a reality today, and fully autonomous self-driving vehicles are now going to become a reality. What does this mean for lighting in automobiles? It means the time to change is upon us, and change is essential to keep up with these other technological developments. The lighting in vehicles has not changed from a purely functional standpoint in a very long time. Future lighting technologies are now on the horizon, and OLED lighting fits very well within this evolution.

From a perspective of being both communicable and adaptive, I view these two characteristics as highly related and will discuss them in a hybrid approach. The ways in which these characteristics overlap will only increase in the future as technology develops.

OLED lighting is communicable

OLEDs provide automakers the ability for their vehicles to communicate with cars and people through additional methods beyond what is possible with LED. OLED features and functionality are unique and provide many options. In addition to OLEDs being highly segmentable, they:

- Are homogeneous
- Are a surface area light source rather than a point source
- Have super high contrast
- Are perfectly defined
- Have significantly wider viewing angle

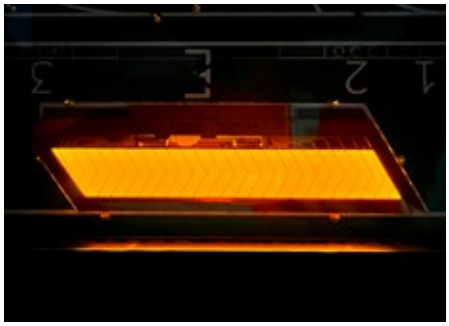
Early generation OLED panel: less than 10 segments. Latest automotive OLED panel: over 600 segments with lit dimensions 56x203mm.

Communication, commonly referred to as "Car-to-X" among other things, is when OLED lighting can communicate danger and sudden changes in speed or road conditions to surrounding vehicles or pedestrians because of their high segmentation. Communicable OLED taillights:

- Further improve road safety
- Improve protection and enhance design
- Offer interactive functionality
- Display danger or warning information; i.e., unsafe road conditions

When it comes to passive and active safety, passive safety features attempt to keep you safe when a collision occurs, and active safety features are those that attempt to prevent or mitigate a collision. When you think about OLED in respect to tail and stop functionality, the star of the show is the segmentation. Highly segmented OLED lights were once unimaginable in terms of their capabilities and communication.

First generation OLED light panels only had a few segments – around 4 to 6 segments to be exact. Second generation OLED light panels are somewhere around 40 to 60 segments, and the generation of panels being manufactured today are panels with 500 segments within an area of about 25 square centimetres. This opens the door for design flexibility and communication options, not to mention the improved safety capabilities. Colour options are widely accessible as well in terms of reds, deep reds, ambers, and variations of white.



Segmented amber OLED panel for automotive

OLED lighting is adaptive

Adaptive rear lighting can measure the visibility condition, modulate the intensity of the light, and provide signalling according to the perception level needed. The other function of adaptive rear lights is to control the rear signalling according to the ambient light level. These lights could adapt to the needs of the driver and according to the weather and road conditions. The system could be similar to the adaptive front lighting system, which can adjust to different road and driving conditions. A very simplistic example of adaptive rear lighting is electric automobiles and the regenerative braking that automatically signals the brake light when the foot is taken off the accelerator. Rear lighting systems can help prevent rear end collisions through increased safety. For example, a dynamic indicator light such as a flashing exclamation point, or other recognisable shapes, has been shown to catch someone's attention quicker than simply a red light, which is found in typical brake lights. There are many concepts that you could expand from this concept such as a dynamic and clear way to display slippery or icy road conditions within the segmented panel to alert the driver in the vehicle behind you. For autonomous vehicles, avoiding accidents and mishaps are significant concerns, as these are very quiet vehicles. These are things to think about.

Further increases to safety are possible by bringing the dynamic segmentation of OLED lighting into the CHMSL (Center High Mounted Stop Light). Innovative design opportunities exist with CHMSLs. The ability to offer further improvements in this area through new designs, thin form factor, flexible, and branding are ideal opportunities for OLED. There are current projects looking into the feasibility of adding OLED lighting between layers of laminated glass in the rear windscreen of vehicles. That would be cool.

If we summarise all of this, we can think of rear lighting in a vehicle, for example, as either "Adaptive Brake Lighting" or even "Dynamic Tail Signalling". OLED lights can illuminate or activate additional lights on rear (fog lights), illuminate other lights (regular tail) at increased intensity or invoke some kind of flashing or safety pattern (CHMSL) during certain emergency braking conditions.

Stay tuned to read the next part of the series and learn more about how OLEDs will change and improve the future of automotive lighting in the ambient and flexible categories.

Image sources: OLEDWorks