

AUTOMOTIVE LIGHTING: TECHNOLOGY, INDUSTRY AND MARKET TRENDS

Market & Technology report - October 2017

Unexpectedly fast growth combined with technology evolution could reshape the industry.

KEY FEATURES OF THE REPORT

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- Automotive lighting market analysis
- Automotive lighting industry analysis including Tier-I players
- Automotive lighting technologies analysis including LED, OLED and laser
- Automotive lighting roadmap analysis

WHAT'S NEW

The report provides a detailed analysis of:

- Emerging lighting technologies including those based on microLEDs, LCDs and lasers
- Advanced front lighting system (AFLS) architecture, and interaction with sensors
- Chinese automotive lighting industry
- Non-visible lighting systems such as infrared and ultraviolet emitters used for automotive applications
- Future trends in automotive lighting

REPORT OBJECTIVES

- Analyze the automotive lighting market and applications' current status and future trends
- Review the automotive lighting industry's structure and future trends
- Discuss the main technologies used for automotive lighting, and associated roadmaps
- Examine the main lighting systems used for automotive applications, and associated roadmaps
- Provide market insights for 2013-2022 for automotive lighting applications

FASTER THAN ANTICIPATED GROWTH WILL SEE THE MARKET REACH \$35.9B IN 2022 THANKS TO WIDE LED ADOPTION

Since the first full light-emitting diode (LED) headlamp was introduced in 2007, LED technology has gradually penetrated headlamp design. LED technology has allowed lighting to become a distinctive feature and enabled innovative functions like the glare free adaptive high beam introduced in 2013.

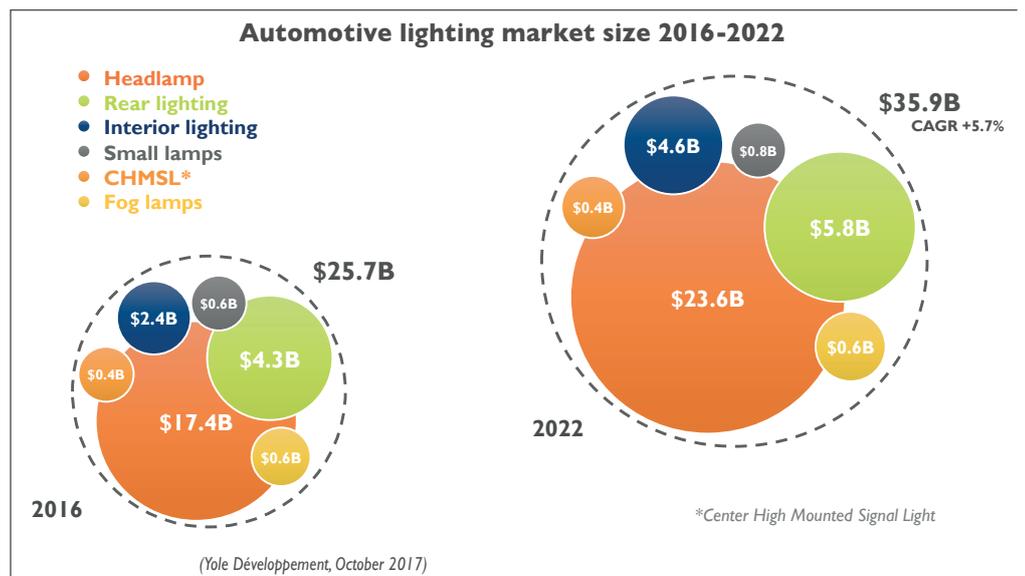
LED technology use had been limited to high-end vehicles and has had to compete with traditional light sources, namely halogen and high-intensity discharge (HID/Xenon). Improved LED performance, lower power consumption and flexible design were the first enablers. Then, cost reductions helped LED technology spread to all vehicle categories.

In this context, the automotive lighting market totaled \$25.7B in 2016 and is expected to reach \$35.9B in 2022 at a 5.7% compound annual growth rate (CAGR₂₀₁₆₋₂₀₂₂). In 2017, Yole Développement estimates that the market should be close to \$27.7B. This growth is driven by natural LED cost erosion, increasing the LED penetration

rate. Standardization of LED modules and their optimization are key factors behind decreasing costs. This has resulted in more vehicles equipped with LED technology.

Automotive lighting is driven by exterior lighting and especially headlamps, generating more than two-thirds of the total market revenue. Rear lighting is the second largest area, representing 17% of total market revenue. Interior lighting represents almost 10% of revenue but growth is expected to be linked to the development of autonomous vehicles and the creation of vehicles as «living homes». Other types of lighting, such as fog lamps, Center High Mounted Signal Light (CHMSL) or small lamps, comprised the remaining 7% of revenue in 2016.

This report presents all automotive lighting applications and the associated market revenue for the period 2013-2022, with details concerning integration status of different lighting technologies and systems, recent trends and market size by application.



FRONT LIGHTING SYSTEMS: THE PIXEL ERA HAS JUST BEGUN

Glare-free adaptive headlamps were made possible by the development of LED matrix systems splitting the front beam into up to 25 vertical segments. Such systems add value by keeping the high beam

enabled even when there is oncoming traffic and therefore increasing the driver's night visibility.

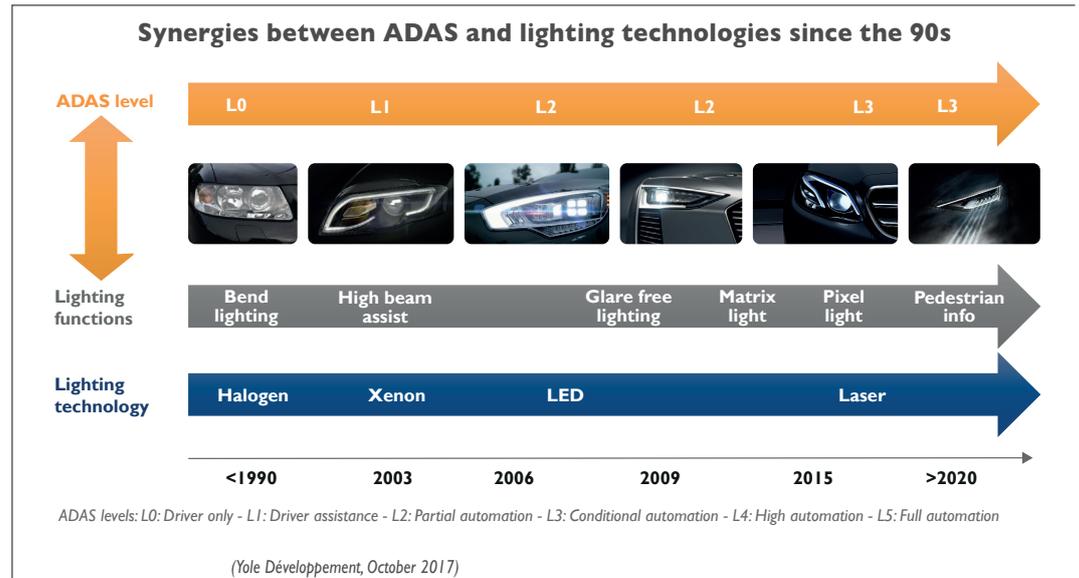
Today, the highest matrix resolution commercially available has 84 pixels per headlamp, making it

possible for the system to create sharp masking zones. But the increase in headlamp resolution has just started, as car manufacturers and Tier-1 manufacturers are developing new technologies to increase it. They're working on very small/micro LEDs, laser or Liquid Crystal Display (LCD) light sources with resolutions ranging from 2,000 pixels to more than 500,000 pixels per headlamp. All these technologies are different but they have the same objective: create new light functions such as roadway marking, driver support or pedestrian interaction.

The main purpose of lighting will no longer be the best visibility for the driver. The focus will become

communication with the environment of the car. Many concepts and proposals have been made for autonomous vehicles and concerns include safety and acceptance by pedestrians. New lighting technologies can enable this interaction but standards and regulations have to be defined.

The report presents a complete overview of new lighting technologies and advanced front lighting systems (AFLS), providing details regarding benefits and drawbacks, integration status, and development roadmap. The report gives insights into the future of automotive lighting with concepts developed by several players.



THE BIG FIVE CONTROL THE AUTOMOTIVE LIGHTING INDUSTRY – BUT WILL IT LAST?

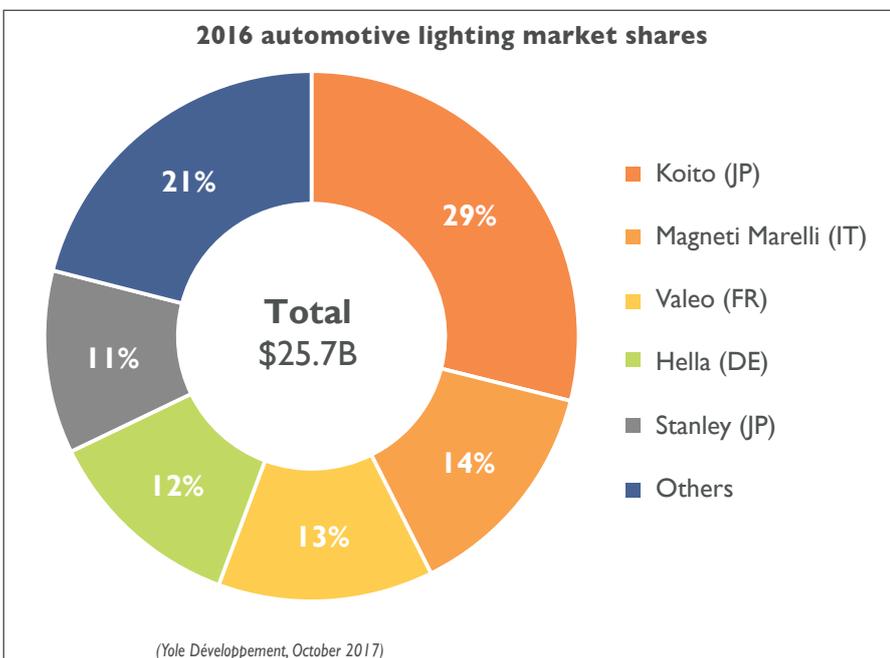
The automotive lighting industry is in the hands of five players: Japan's Koito and Stanley, Italy's Magneti Marelli, France's Valeo, and Germany's Hella. Among 20 competing companies, the big five received 80% of

the total automotive lighting revenue in 2016.

To keep ahead, the leading players are innovating and developing new technologies, including integrating organic LEDs (OLEDs) and new LED, LCD or laser light sources. But these companies are being challenged by smaller ones like India's Varroc Lighting Systems and Austria's ZKW, who are focused on integrating new components and technologies using laser or OLED light sources and developing new lighting systems, electronics and/or software.

Some players are growing faster than the market. Japan's Ichikoh is taking advantage of its takeover by Valeo. China's Xingyu benefits from the fast growth of the Chinese automotive market, which will boom in the next five years. Asia, and mostly China, represents the next main opportunity in the automotive market, with nearly 65% of vehicles to be sold in the region between 2017 and 2022.

This report presents an analysis of the automotive lighting industry with details about the top 15 suppliers' revenue and market share in total and by region. The report also includes a focus on the Chinese automotive lighting market and industry.



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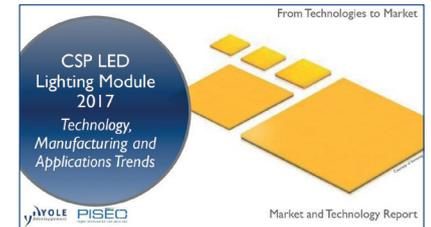
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9. GOVERNING LAW AND JURISDICTION

- 9.1 Any dispute arising out or linked to these Terms and Conditions or to any contract (orders) entered into in application of these Terms and Conditions shall be settled by the French Commercial Courts of Lyon, which shall have exclusive jurisdiction upon such issues.
- 9.2 French law shall govern the relation between the Buyer and the Seller, in accordance with these Terms and Conditions.