Automotive Exterior Lighting
Market and Technology Trends

Andrew Herzig, Senior Analyst, Component Forecasts
andrew.herzig@ihs.com
Automotive Exterior Lighting

Presentation Overview

• Introducing IHS Automotive
• Developments in technology to-date
  • Headlamps
  • Rear lamps
• LED growth drivers and challenges
• New design opportunities
• Outlook: technologies and trends
INSIGHTS THAT DRIVE THE AUTOMOTIVE INDUSTRY
Global, interconnected and highly complex

IHS AUTOMOTIVE
With more than 5,000 parts per vehicle, sourced from a global market to meet the unique needs of a highly-empowered consumer, it takes more than just “insight” to compete in today’s automotive market. IHS Automotive delivers a powerful combination of actionable, data-driven insights, expertise and knowledge-based solutions to drive competitive advantage for automotive stakeholders.

IHS AEROSPACE, DEFENSE & SECURITY
From logistics to light patrol to special operations, ground vehicles are a critical component of a modern armed force. What current and future requirements must the automotive industry understand in order to grow market share with military customers? IHS has the answer.

IHS ECONOMICS & COUNTRY RISK
Global product planners and purchasing departments rely on IHS Economics forecasts and “what-if” scenarios to support global sourcing strategies and product programs. Strategic planners in the automotive industry rely on our risk forecasts to enter new markets. From political stability to protectionism and labor unrest, IHS Country Risk enables confident market entry in complex environments.

IHS PRODUCT DESIGN & ENGINEERING
Today, automotive manufacturers and suppliers spend more than 2 years and over $1 Billion USD to launch a new vehicle. Changes or delays can be catastrophic. IHS mission-critical insight for product planners, engineers and designers enables greater accuracy and speed in decision making.

IHS OPERATIONAL EXCELLENCE
From truck to train to plane to ship, today’s automobiles are comprised of a complex web of parts and electronics, sourced from an interconnected network of suppliers. IHS provides powerful quality risk management and cost optimization tools that help improve product quality and optimize the global supply chains.

IHS CHEMICAL
With the advent of advanced plastics, today’s automobiles are lighter, stronger and more resilient than their “metal-based” ancestors. IHS offers comprehensive insight spanning from raw material sourcing to fabrication and advanced applications.

IHS ENERGY
Gas, diesel, electric, hydrogen or hybrid? Market demands and global regulations are reshaping what “fuels” tomorrow’s vehicles. IHS Energy insights can help automakers plan and position for the future while managing the risk of their powertrain investments.

IHS TECHNOLOGY
Consumer expectations and industry regulation is generating a tsunami of technology content and complexity in today’s vehicles. From sensors, to navigation, infotainment and automation – IHS provides “first mover” insight into the connected car.

IHS MARITIME & TRADE
In a truly global market, auto makers depend on ocean shipping for raw materials to finished vehicles. IHS Maritime & Trade insights and global tracking applications empower automotive logistics, purchasing, and supply chain specialists with greater visibility and the ability to better manage risk.
Components and Technology coverage (Core components)

**Thermal**
- A/C Compressor
- A/C Condenser
- A/C Hose & Tube
- Charge Air Cooler
- Cooled EGR
- Active Grille Shutter
- Engine Cooling - Motor and MFS
- Engine Cooling – Radiator
- HVAC – Blower
- HVAC - Control Panels/Zones
- HVAC - Flap Actuator
- HVAC – Module
- HVAC – Sensor
- New Refrigerant
- Supplementary Heating
- Water Pump

**Electrical/Electronics**
- 12-36/48 Volt Market Study
- Central Body Control Module
- Engine Control Unit
- Immobiliser
- Keyless Entry System
- Power Door
- Power Sunroof
- Power Trunk
- Power Window System
- Powertrain Sensors
- Sunroof System & Design
- TPMS
- Transmission Control Unit
- Wiring Harness

**Interior**
- Airbag Module
- Door Trim Panel
- Seat Adjuster
- Seat Assembly
- Seat Climate - Seat Thermal
- Seat Ergonomics
- Seat Fabric & Leather
- Seat Power & Memory
- Seat Recliner

**Exterior**
- Front Lighting
- Front Lighting + ECU
- Headlamp
- Tail Lamp

**HMI**
- Center Stack Display
- Head-Up Display
- Instrument Cluster Display

**Infotainment**
- Audio Speakers
- Headunit Systems
- Telematics

**Powertrain**
- Alternative Propulsion
- Camshaft Drive
- Cylinder Block
- Exhaust Cold End
- Exhaust Manifold
- Fuel Injector
- Intake Manifold
- Throttle Body
- Torque Transfer
- Turbo/Supercharger
- VVT

**Chassis**
- Brake System
- Brake System & Brake Pad
- Power Steering System
- Shock Absorbers and Struts
IHS Component forecasts are linked to other core IHS products such as the production and powertrain forecasts.
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Developments in headlamp technology: Halogen

1960s
1970s
1980s
1990s

1962: First tungsten-halogen headlamps
1986: First projector headlamps
1990: First multi-reflector headlamps

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Developments in headlamp technology: Xenon

1990s

1992: First HID (xenon) headlamps


2000s

2003: First Advanced Front-Lighting Systems (AFS)

Source: Hella
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Developments in headlamp technology: LED

2000s

2007: First full-LED headlamps

Source: Lumileds

2010s

2013: First digitally controlled, full-LED glare-free adaptive high beam

Source: Audi

Source: consumerreports.org

Source: Hella
LED headlamps – all vehicle segments and car makers

- Premium sports car: Audi R8 – SOP 2007
- Luxury saloon: BMW 7-Series – SOP 2008
- Premium SUV: BMW X6 – SOP 2009
- Luxury coupé: Mercedes CLS – SOP 2010
- C-Segment – SEAT Leon – SOP 2012
- Hybrid/electric vehicles – BMW i3 – SOP 2013
- B-Segment – VW Polo – SOP 2014
- Passenger van – Mercedes V-Class – SOP 2014
- All car makers - e.g. Ford Mondeo, Jaguar XF, Mini, Nissan Qashqai, Opel Astra, Peugeot 308, Porsche 911, Renault Megane, RR Evoque, Volvo XC90
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GLOBAL* LIGHT VEHICLE HEADLAMP TYPE PENETRATION  2010 - 2020

Global* - Europe, North America, Japan, Korea, China, India, Brazil & Argentina

Source: IHS
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Developments in rear lamp technology: Bulbs => LEDs

1980s: LEDs first used in high-mounted brake lamps
1990s: 2000: first all-LED rear lamps
2000s: 2004: adaptive LED brake lamps

Source: BMW
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GLOBAL* LIGHT VEHICLE REAR LAMP TYPE PENETRATION  2010 - 2020

Global* - Europe, North America, Japan, Korea, China, India, Brazil & Argentina

Source: IHS  © 2015 IHS
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Factors driving LED growth

• White LEDs produce near-daylight for headlamp applications

• LEDs offer better optical precision than halogen especially – less stray light/glare

• LEDs are directional emitters, unlike with halogen/xenon, so you do not need a full parabolic reflector in the headlamp – just a small, cheaper reflector will provide the necessary light reflection

• Efficiency – Halogen offers 15-30 lumens per watt, LEDs offer 60-120 lumens per watt

• LED efficiency will continue to improve over coming years, whereas traditional lighting sources have reached their maximum efficiency

• Low power consumption and lower weight make LEDs ideal for electric vehicles – savings translate directly into increased range

• Environmental factors – LEDs last lifetime of vehicle, contain no mercury and contribute to lower CO2 emissions

• Faster illumination and focused brightness of LEDs a considerable safety benefit for brake lamps and CHMSLs

• Momentum: Advantages of LED over Xenon is leading to industry-wide preference for LED in upper/mid segments, extra scale thereby ever narrowing the price differential
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LEDs mean new design opportunities

Source: Audi
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LEDs facilitate brand/model differentiation
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LEDs mean new design opportunities
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**LEDs enable huge variety of designs**
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LEDs enable huge variety of designs
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Outlook: Developing technologies and trends

- Headlamps: LEDs will largely displace xenon in medium term, but halogen will continue as lowest cost option into longer term
- Success of xenon headlamp systems under 2000-lumen threshold
- Adaptive Driving Beam (ADB) allows dynamically variable beam distribution – system now offered in mid-segment (new Vauxhall/Opel Astra)
- Further ADAS and exterior lighting function integration
- LEDs continue to proliferate in all front and rear lighting functions
- Unprecedented interest in and emphasis on design and performance of exterior lighting is bringing new companies and their expertise/technologies into the supply chain
- Design freedom afforded by new technologies allows OEMs and their suppliers to continually evolve their “lighting brand image” and create the “latest look” – e.g. pixels have been replaced by light guides/bars
- Challenge of regional regulations: (temporary?) barriers to bringing innovative technology to regional markets and to development of standardised lighting modules
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Outlook: Headlamps – LEDs with lasers

Audi and BMW in “race” to bring first “laser headlamps” to market: in reality, these are LED headlamps with a laser long-range high-beam spotlight
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Outlook: Rear lamps – OLEDs

OLED = Organic Light-Emitting Diode


Source: Audi

Source: BMWblog
Thank you for your attention