Research Report
ABOUT Automotive

AUTOMOTIVE

The global automotive exterior LED market

Including detailed market fitment, volume and value estimates and forecasts of all exterior LED lighting applications in Western Europe, Japan and North America through 2015

January 2011

By Daniel Stern

ABOUT Publishing Group

Contents

List of tables

List of figures

Tables 3 and 4 set out our predictions for the LED rear combination lamp market (by fitment rate and volume) across Western Europe, Japan and North America from 2010 through 2015.

Table 3 LED rear combination lamp[1] percentage fitment rates for passenger cars and light trucks, Western & Eastern Europe, Japan and North America, 2010 - 2015 (Percentage fitment)

	2010	2011	2012	2013	2014	2015
Western Europe	5	6	8	11	13	15
Eastern Europe	2	3	3.5	5	8	9.5
Japan	6	7	9	11	15	17
North America	11	13	15	16	18	

[1] Using LEDs for tail, stop, and indicator functions

Source: ABOUT Automotive, Driving Vision News

Table 4 LED rear combination lamp[1] fitment volumes for passenger cars and light trucks, Western & Eastern Europe, Japan and North America, 2010 - 2015 (Vehicle count)

	2010	2011	2012	2013	2014	2015
Western Europe	645,000	744,000	992,000	1,496,000	1,8[illegible]00	[illegible],000
Eastern Europe	114,000	177,000	[illegible],500	36[illegible]0	6[illegible]00	798,000
Japan	5[illegible]	[illegible]00	[illegible]000	1,22[illegible]0	1,5[illegible]00	1,54,000
North America	[illegible]0	97[illegible]0	[illegible]0	26[illegible]	2,5[illegible]00	2,80,000
Total	2,231,[illegible]	[illegible]	[illegible]74,[illegible]	350[illegible]	6,5[illegible]	7,892,000

[1] Usi[illegible]s fo[illegible], stop, and indicator functions

Source: ABOUT Automotive

2.4.3: LED CHMSL forecast (fitment rate and volumes)

The LED CHMSL has become nearly universal

The CHMSL was the first rear lighting function to be implemented with LEDs. Today, most vehicles built in Western Europe, Japan, South Korea, and North America have an LED CHMSL. Previous forecasts had European markets with a large and enduring lead over American and Japanese markets in terms of LED CHMSL fitment rate, but since our last report the LED CHMSL has become nearly universal.

Table 5 LED CHMSL percentage fitment rates for passenger cars and light trucks, Western & Eastern Europe, Japan and North America, 2010 - 2015 (Percentage fitment)

	2010	2011	2012	2013	2014	2015
Western Europe	94	95	96	[illegible]	[illegible]8	[illegible]8
Eastern Europe	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]9	[illegible]1
Japan	[illegible]	[illegible]4	[illegible]5	[illegible]	[illegible]7	[illegible]8
North America	[illegible]9	92	[illegible]4	94	95	96

Source: ABOUT Automotive, Driving Vision News

There are a number of additional points to consider before using the data in the following tables.

First, while we make reasonably accurate market volume forecasts based on manufacturers' confirmed orders over the next few years, market value forecasts extrapolate this data based on a wide variance in unit prices.

Second, the same lighting application may, of course, be priced differently depending on where it is sold.

Third, while manufacturers continually add technological features to their latest generation light sources, carmakers maintain pressure to reduce unit costs year-on-year. LEDs, like other electronic components, are subject to sharp fluctuations in demand and downward trends in prices.

LED manufacturers are reporting some real conflicts between themselves and certain customers

Fourth, LED manufacturers are also reporting some real conflicts between themselves and certain customers, i.e., some customers already view LEDs as a commodity. Yet manufacturers argue that although LEDs is a known technology, it still faces many technical challenges and the rate of product evolution remains enormous.

According to industry figures, a pair of basic LED headlamps with levelling and washing components supplied to a European carmaker will cost approximately €450. That price could fall to €310 by 2012.

2.5.2: Full-LED headlamp forecast (market values)

Table 10 Full-LED headlamp market value for passenger cars and light trucks, Western & Eastern Europe, Japan and North America, 2010 - 2015 (in millions of constant 2010€)

	2010	2011	2012	2013	2014	2015
Western Europe	32.5	56.76	125.6	183.6	269.7	272.1
Eastern Europe	10.1	22.48	18.7	[illegible]	79	7.1
Japan	57.5	7.28	02.3	[illegible]	1[illegible].6	3.9
North America	[illegible]3	[illegible]8	[illegible]9	1[illegible]1	1[illegible]	[illegible]9.5
Total	[illegible].4	198.32	342.5	462	622.9	652.6

Source: ABOUT Automotive

2.5.3: LED rear combination lamp forecast (market value)

We estimate that the wholesale cost of a pair of rear combination lamps using LEDs for all the main functions—stop, tail, and indicator—is about €72 (€44 in USA due to allowance of single red tail/stop/indicator lamp) although given expected demand, that price could easily fall to about €62 (€40 USA) by 2012. On that basis, table 11 sets out our predictions for the LED rear combination lamp market across Western Europe, Japan and North America from 2010 through 2015.

Chapter 3

Technical review

3.1: Evolution—output & luminous efficacy

There is little prospect for a substantial improvement in the efficacy of filament or HID Xenon bulbs

The amount of light available from a light source per unit of power input is called luminous efficacy and is expressed as lumens per watt (lm/w). Halogen filament headlight bulbs produce between 18 and 34 lm/w, while HID Xenon bulbs produce about 90 lm/w. There is little prospect for a substantial improvement in the efficacy of filament or HID Xenon bulbs; both are thoroughly mature technologies. The efficacy of white high-output LEDs, on the other hand, is rising at a very fast pace. Efficacy should not be confused with efficiency, which in the context of automotive lighting is used to describe the percentage of light from the light source—the LED or filament, for example—that is integrated usefully into the output beam from the lamp. Traditional halogen headlight bulbs produce between 1000 and 1500 lumens from between 60 and 70 watts, for luminous efficacy of about 20 lumens per watt. The beam from a headlamp so equipped contains between 300 and 700 lumens, for an optical efficiency of about 30 to 50 percent.

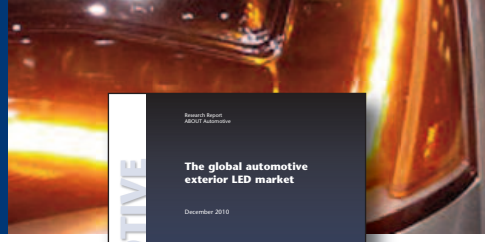
Thermal considerations limit the power of an LED array

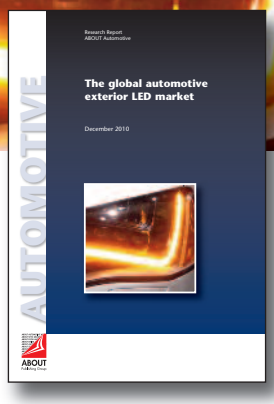
Present state-of-the-art white headlamp LEDs boast efficacy of more than 70 lumens per watt, but thermal considerations limit the power of an LED array. A 14w Osram Joule LED headlamp light source, for example, produces about 750 lumens—this figure is climbing—but the high efficiency of optics used to create headlamp beams from LEDs means such headlamps can give very high performance despite the source light being less than or equal to that of halogen bulbs.

LEDs of all colours have steadily improved in output, efficiency, and efficacy. But the blue-LED basis of white LEDs is of particular interest because the lack of a practical white LED had held back the use of LEDs for applications of illumination, rather than merely for indication. In the early 1990s, practical blue LEDs were developed by Nichia engineers in Japan. This set the stage for white PC-LEDs, which were first presented by Osram in 1996. Blue LED technology carried on developing; by and by previous limits fell away. It had been necessary to use relatively high currents to get practically usable levels of light, but the current heated up the emitters, causing efficiency to nosedive and the emitters to over-heat.

In 2003, Cree demonstrated new white PC-LEDs producing 65 lm/w with just 20 milliamperes (mA) of current. This was the highest-intensity white LED commercialised, with quadruple the efficacy of most incandescent lamps. This commercialisation was what first brought LED headlamps to mind as a genuinely feasible idea. The development race sped up; in 2006 Cree showed a prototype producing 131 lm/w—over double the 2003 figure—from the same 20mA of current. The next year, Seoul Semiconductor achieved 135 lm/w, and in 2008 Nichia's white LEDs reached 150 lm/w while Osram's ultra-high-output white LEDs topped 135 lm/w. Early in 2010, Seoul Semiconductor released 150 lm/w white LEDs

The global automotive exterior LED market





LEDs – lighting technology of the future

Their small size, powerful light emission, extreme reliability, low energy requirement and long lifespan support the widely held view that LEDs are the technology of the future for automotive lighting. Indeed, since the first edition of this report was published in 2005, the sector has continued to witness a blistering rate of innovation. The evolution of the LED module has outstripped and outpaced the expectations of the automotive industry - even the experts nearest the front lines of research and development.

Brand new research on the automotive exterior LED sector

This report highlights the findings of research conducted throughout 2010 by ABOUT Automotive in the automotive exterior LED market. It is largely based on our research, analysis and interviews with a number of industry experts, gathering individual perspectives.

The study updates and extends our previous analysis of this sector, published in 2005 providing some insights in a number of areas, including

- The market for automotive exterior LED lighting, determining the trends and topical issues;
- The main manufacturers serving this sector, identifying how the market is divided in terms of market share on a regional basis; and
- Trends in key product and process technologies, both current and future

Brand new research on the automotive exterior LED sector

- Will LED headlamps completely supplant HID Xenon, and how quickly will it erode the market share of Halogen lamps?
- To what extent are vehicle manufacturers exploiting opportunities for visual brand identification and differentiation?
- Will LED systems be cost-competitive with Xenon HID systems by 2015?
- To what extent does the proliferation of packaging have on the potential to cause problems with serviceability and parts availability?
- Do today's early examples of application-ready, fully-packaged LED arrays point the way towards the standardised system architectures of tomorrow?
- What are the implications of new Daylight Running Lamp (DRL) directives for LED implementation?
- Do the advantages of LED emitters outweigh any potential safety shortcomings?

Published: December 2010 Price: £395 No. pages: 30 Format: PDF

Report contents

Chapter two sets out our detailed market fitment, volume and value forecasts for exterior LED lighting applications for Western Europe, North America and Japan.

Chapter three reviews the technical trends and challenges that the sector currently faces. It evaluates how quickly LED headlamps' performance, efficacy and cost-effectiveness are improving.

Chapter four provides brief profiles of a selection of the main players in the LED market, namely:

- Cree
- Nichia
- Osram Opto Semiconductor
- Philips Lumileds
- Seoul Semiconductor
- Stanley

ORDER FORM

1 Purchase information

☐ I would like to purchase

The global automotive exterior LED market

Quantity	Price*	Total
	£395	

*Reports are supplied electronically as a PDF.

2 Personal details

(Please attach your business card or complete the following in capitals)

Name (Mr/Mrs/Ms/Dr)

Job title

Company name

Address

City

Zip/postcode Country

Nature of business

Tel

Fax

E-mail

3 Payment method

☐ I enclose a cheque for £ _____ payable to **ABOUT Publishing Limited.**

Customers can pay by cheque with either of the following methods: Sterling cheques drawn on a UK bank. Cheques in US dollars, euros or in any freely convertible currency drawn on the country of origin at current exchange rates.

☐ Please charge £ _____ to my ☐ Visa ☐ MasterCard

Account number

Name

Valid from

Signed

Expiry date

☐ Please send me a proforma invoice (Report(s) will be sent on receipt of payment)

The above prices do not include VAT. Customers in EU member countries may be liable to pay VAT if their Registration Number is not supplied. Please enter your EU Registration Number (VAT/TVA/BTW/MOMS/MWST/IVA/FPA) below:

4 Please send your order to

ABOUT Publishing Group Limited 21 Noel Street, London, W1F 8GP, United Kingdom

T: +44(0)20 7434 1269 F: +44(0)20 7434 1545

e-mail: sales@aboutpublishing-auto.com www.aboutpublishing-auto.com

ABOUT Publishing Limited. Registered in England No. 4344194. Registered office: 21 Noel Street, London, W1F 8GP.

AUTOMOTIVE

ABOUT Publishing Group

21 Noel Street
London
W1F 8GP
United Kingdom
T: +44(0)20 7434 1269
F: +44(0)20 7434 1545
Email: admin@aboutpublishing-auto.com

www.aboutpublishing-auto.com