Global market review of automotive lighting – forecasts to 2013

2008 edition

Just-auto

Global market review of automotive lighting – forecasts to 2013

2008 edition

By Daniel Stern

January 2008

Published by

Aroq Limited
Seneca House
Buntsford Park Road
Bromsgrove
Worcestershire
B60 3DX
United Kingdom

Tel: +44 (0)1527 573 600
Fax: +44 (0)1527 577 423
Web: www.just-auto.com

Registered in England no: 4307068

Single-user licence edition

This report is provided for individual use only. If you would like to share this report with your colleagues, please order additional copies or sign up for a multi-user licence by contacting:

Holly Nash
Research manager, just-auto.com
Tel: +44 (0)1527 573 609
Email: holly.nash@just-auto.com

Incredible ROI for your budget – single and multi-user licences

We understand the pressure your research budget is under and price our reports realistically. You won't find our reports with four, or even five-figure price tags, but you will find that they make some of the competition look expensive. Each title is available to you on a single-user basis, supplied on the strict understanding that each title is not to be copied or shared. Alternatively, titles can be shared within departments or entire corporations via a cost-effective multi-user licence. Multi-user licences can also save you money by avoiding unnecessary order duplication. To further add value, all multi-user

copies are hosted on a password protected extranet for your department or company – saving you time, resources and effort when sharing research with your colleagues. To find out more about multi-user pricing, please contact Holly Nash.

just-auto.com membership

From just GBP99/US$195/EUR155* a year you will gain access to a growing portfolio of exclusive management briefing reports, and also receive 12 new briefings for each year you are a member. As well as this impressive list of members' only reports, you also gain one year's access to a constantly-updated stream of news, feature articles and analysis. Established in 1999, *just-auto* has rapidly evolved into the premier source of global automotive news, analysis and data for busy senior executives. For details of the current special joining offer visit: **www.just-auto.com/offer.aspx**

*Prices correct at time of publication.

Table of contents

List of figures

List of tables

About the author

Daniel Stern is an automotive lighting consultant based in Toronto, Ontario. He is an appointed member of the US Transportation Research Board Visibility Committee, which steers North American research on matters related to automotive conspicuity, lighting performance and regulation. He attends and participates in the world's automotive lighting symposia, and has attended the international ECE automotive lighting regulation meetings at the invitation of Transport Canada's regulator of automotive lighting.

Introduction: Facts and figures at a glance

x: The percentage by which crashes could be reduced with Daytime Running Lights (DRL).
xx: The minimum system wattage for a legal DRL system.
xxx: The wattage of some DRL systems as implemented.
xxx: Fuel savings, miles per gallon, with 14w DRL instead of 200w DRL.

xx: The average prevalence of halogen headlamps on new vehicles worldwide.
xx: The projected prevalence of halogen headlamps worldwide in 2015.
xx: The percentage of performance increase with newly-designed halogen headlamp optics.
xx: The number of different halogen headlamp bulb types available worldwide.
1972: The year the H4 bulb was introduced.
xx: The percentage of new 2008 halogen headlamps worldwide that use the H4 bulb.
xx: The percentage of performance increase with the new H11 bulb rather than the old 9006.
xx: The percentage of performance increase with the new HIR2 bulb rather than the old 9006.

xx: The average prevalence of HID headlamps worldwide, in percentage terms.
xx: The percentage of all new vehicles offered with Xenon headlamps in North America.
x: The percentage of 2007-2008 vehicles equipped with Xenon headlamps in North America.
xx: The percentage of North Americans who want Xenon headlamps.
xx: The percentage of North American car dealers untrained to sell premium headlamps.

xx: The percentage of all new vehicles offered with Xenon headlamps in Europe.

Chapter 1 Overview of a unique industry

The industry today

Every year, the automotive lighting industry supplies billions of dollars' worth of lamps, lights, bulbs, reflectors and related devices to the world's vehiclemakers and a bustling aftermarket. This differs little from the industry of any other category of automotive components. However, the lighting sector is unique in the degree of cooperation among its major and minor participants and its degree of global integration. This is due, in part, to the industry's vibrant and vigorous programme of symposia, congresses and conferences at which the latest research and technology is showcased and discussed in great detail among the industry's community of researchers, marketers, regulators, scientists, and principal consumers.

In Europe, there are the International Symposium on Automotive Lighting and the V.I.S.I.O.N. congress, the former held in Germany in odd-numbered years and the latter in France in even-numbered years. In North America, the National Academy of Sciences' Transportation Research Board maintains a Visibility Committee with annual conferences and symposia where automotive lighting research is discussed and planned. These research and development expositions form a framework within which working groups, particularly in Europe, can develop and commercialise new technology in a rapid and coordinated fashion. Such working groups defined the parameters and sped the adoption of the world's first halogen headlamps in the early 1960s, the first H4 dual-beam halogen headlamps in the early 1970s, Xenon HID headlighting systems in the early 1990s, and advanced AFS front-lighting systems in the early 2000s.

As a result of this type of research openness, life in the world's automotive lighting industry is rather like life in a small town: almost everyone knows what almost everyone else is doing, most of the time. Everyone is working on advanced front-lighting systems and light-emitting diode (LED) headlamps and tail-lamps. Everyone offers BiXenon headlamps. Everyone can do a combination rear lamp that looks all red, but lights up in the three required colours. Of course, this sometimes makes it difficult to ascertain the true

originator of a new invention in the field. Hella, Valeo and a precursor company to AL-Automotive Lighting all claim to have invented the polyellipsoidal headlamp, and it would be difficult to discredit any of the claims. This is not to deny or belittle the various players' specialities, nor their many innovations and advances in technique and practice. Valeo is justifiably proud of its special high-efficiency NEO headlamp optics, just as Hella takes special pride in its non-glare high beam, Koito in its ultra-compact projectors, ZKW in its talents with PEI material and polycompliant optics, and so on. But beyond these sorts of innovations, the various individual companies' products have long been differentiated less by fundamental technology than by unique techniques and their underlying engineering and design philosophy.

The profile of the automotive lighting industry has lately been undergoing rapid and significant change, under the combined influences of multiple forces. Lighting regulations, once many in number and significantly different in technical prescriptions in the world's many markets, are now greatly reduced in number and substantially harmonised in content. Aspects of lighting performance long left unregulated, such as pedestrian compatibility in crashes, are now being fast-tracked for regulation that will significantly affect the way lamps are designed and built. Markets have consolidated, as have vehiclemakers and lighting suppliers, giving rise to regionally- rather than nationally-based players round the world.

Lighting technology has advanced at a staggering pace since the beginning of the 21st century, presenting an array of engineering and design options of unprecedented width. At the same time, vehicle stylists and buyers have grown considerably more daring and demanding, so the wide range of options, considered a mere luxury until recently, is now a necessity. The emergence and stratospheric growth of both supply and demand for vehicles (and, therefore, for vehicular lighting systems) in developing nations has significantly pushed and pulled at the world's automotive lighting makers. As a result, international and intercompany cooperation is at an all-time high in the industry.

The globalisation of the auto industry, with the concomitant cost pressures, could reasonably have been expected to create new competition among auto lighting firms that have historically been largely kept separate by disjointed markets, and that has certainly occurred. However, the opposite effect is also quite prominent: companies that not long ago competed against one another

are now collaborating, as are companies formerly in simple vendor/buyer relationships. Technique, practice, subcomponents, and even customers and build facilities are being shared at an unprecedented level. This is occurring not only in the first world (as for example with ValeoSylvania in the US, Hella-Stanley in Australia and the Ichikoh-Valeo alliance in Europe), but also to a significant degree in developing countries (for example, the ZKW-Neolite joint venture in India). Partnerships, joint ventures, and other collaborative arrangements serve to accelerate the presence and prevalence of better lighting on the roads of developing countries. In a broader context, cooperative arrangements are elevating the industry's best practices and reducing the cost of every given level of automotive lighting sophistication through economies of scale.

Significant regulatory pushes

In the past, each country decided and set its own technical standards and installation requirements for automotive lighting devices and systems. But as automobiles grew reliable enough to support international travel, and as the world's vehiclemakers sought to sell vehicles outside their domestic markets, it became generally desirable to reduce the proliferation of different requirements and technical standards. The effort towards defining standards that would be acceptable across international borders began in 1958, when the member countries of the 'Common Market' (the forerunner of the European Community and now European Union) agreed on standards, requirements, and permissions for vehicle lighting equipment. That original 1958 agreement, which in the 1990s was opened to participation by non-European countries, still forms the framework for the development of today's United Nations Economic Commission for Europe (ECE) automotive lighting regulations that are adhered to in most of the industrialised world. Countries such as China, Japan, Korea, Australia and India, where unique national standards previously were in force, have now largely or completely adopted ECE requirements for vehicular lighting devices and systems.

Regulations in North America, however, do not follow this internationalised agreement. Instead, North American automotive lighting requirements are primarily determined by the US' Society of Automotive Engineers (SAE) or Federal Motor Vehicle Safety Standard (FMVSS) regulations. The North American regulations differ significantly from the international ECE regulations in regulatory philosophy, content, format, device and system performance and

Chapter 2 Market review of lighting technologies

Daytime running lights

Daytime running lights (DRLs) are lamps that are intended to draw attention to road-going vehicles during the daytime. They were first introduced in Nordic countries in the 1970s, and their adoption by other countries proceeded at a moderate pace in the following decades. DRLs have been required equipment on all new vehicles in Canada since 1990, permitted equipment in the US since 1995, and are now either permitted or required in many jurisdictions worldwide. In some jurisdictions such as Japan, however, they are prohibited. Extensive study of the potential safety benefit of DRLs has yielded varying results, but many studies suggest some degree of safety benefit, and the jurisdictions banning DRLs are predicted to decrease in number over the next six years. The most recent European study[1], for example, suggests DRLs could reduce crashes by xxx%. The interest level in DRLs has recently risen sharply, together with the pitch of debate over whether and how they should be implemented.

The chief objections to DRLs are pollution and glare. DRL power consumption is highly variable, depending on how they are implemented; present DRL systems consume as little as 14w for a dedicated LED system, to over 200w for a system that runs all the vehicle's headlamps, position lamps and marker lights. This equates to a reduction in fuel economy of xxxxx%. Internationally, governments are currently struggling to balance the potential safety benefit offered by DRLs with the increased vehicle fuel consumption their use entails. Because the power to run the lights is produced by the engine, additional fuel is required to power the DRL. High-power DRL systems can increase vehicular CO_2 emissions significantly enough to hamper a country's efforts at reducing greenhouse gas emissions.

[1] *Estimation of the effects of a legislation on daytime running lights for cars on road accidents*, published September 2007, by the German Federal Ministry of Transport, Building, and Urban Affairs.

The effect of DRL on fuel consumption and emissions has historically not been a significant concern in the North American market, where US Federal emissions and fuel economy test protocols permit the DRLs to be disabled during testing. This provision, however, is expected to be withdrawn in the near future. Therefore, low-power solutions are of increasing interest in the NAFTA market, and are being encouraged for use when and if DRLs become mandatory in ECE Regulations. LEDs and low-wattage, high-efficacy, long-life light bulbs create appropriate amounts of light for an effective DRL without significantly increasing fuel consumption or emissions. Fuel savings of up to xxxl/xxxkm are possible by implementing a 55w DRL system rather than a 200w DRL system, and DRL fuel consumption can be reduced to complete insignificance by the use of 14-20w DRL systems.

North American regulations permit much higher maximum DRL intensity than is allowed by international ECE regulations. The highest-intensity North American DRL implementations, based on modified operation of headlamps, have given rise to numerous glare complaints and safety problems due to drivers mistakenly driving with DRLs at night and in inclement weather, rather than with headlamps. Consumer reaction to high-glare DRLs, particularly in the US, has been negative to such a degree that anti-DRL groups have lobbied for DRL bans, and organised boycotts of vehiclemakers equipping their cars with high-intensity DRLs. While not all of these have been entirely successful, they have, in some cases, done considerable damage to certain vehiclemakers' publicly-perceived reputations for safety. Fortunately, the North American and ECE DRL regulations now share a large enough window of overlap that a single DRL can meet requirements and market preferences worldwide.

On the other hand, the ECE regulations permit DRLs to emit only white light, while North American regulations permit white, yellow or amber light. This North American provision is increasingly being used to implement effective DRLs that do not produce objectionable glare or lead to improper use of headlamps at night, and consume less fuel than headlamp-based DRLs. This is done by burning the vehicle's front turn indicators full time as DRLs, except when one of them is flashing to indicate an intended turn or lanechange. Valeo Lighting Systems' engineering director Jean-Paul Charret says: *"In North America, you have on each vehicle two lamps ideally designed and positioned for DRL: the front indicators."* This system was popular when Canada first required DRLs in the early 1990s, but driver frustration with short bulb life pushed the market towards other implementations. Since that time, the light

source industry has responded with new ultra-long-life light sources to solve the life issue. These include the 5702KA and 4114K conventional bulbs offered by GE, Sylvania and Wagner, the new HiPerVision life-of-car bulbs developed by Philips, and numerous LED light sources from Lumileds, Osram and others. GM's entire Cadillac range, as well as the Chevrolet Corvette and Express and GMC Savanna, Ford's Lincoln MKZ and many Toyota and Lexus trucks and SUVs, are among the vehicles using turn-indicator DRL systems in the North American market.

Safety with style

The introduction of white LEDs with high enough performance for use as DRLs has shifted the discussion in new directions. White LEDs offer the bright white light colour that is currently considered fashionable. While their initial cost is higher than that of more traditional light sources, their zero-maintenance, life-of-the-vehicle durability and trivial power consumption are allowing vehiclemakers such as Audi to market DRLs as a safety-with-style feature. BMW, on the other hand, has expanded the function of its 'angel eye' ring-shaped parking lamps, strengthening the visual image of its brand DNA while providing added value and safety by using the newly brightened angel eyes as DRLs in markets throughout the world.

Tungsten-halogen headlamps – prevalent for the foreseeable future

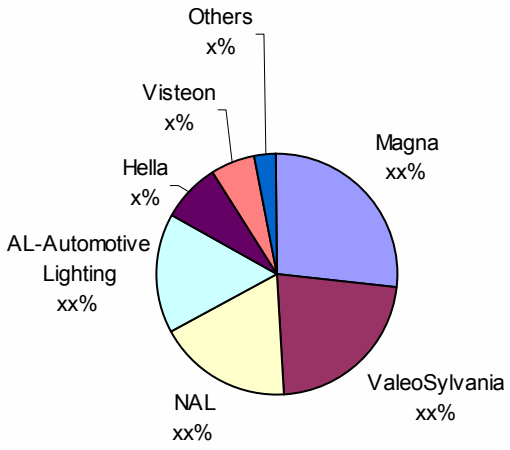
Tungsten-halogen headlamps were introduced in Europe in 1962 and in the US 17 years later. Compared to earlier plain tungsten lamps, halogens significantly boosted headlamp performance and efficiency, and for several decades held virtually xxx% of the world headlamp market. Today, they still hold xxxxx% of the market worldwide.

Despite the advent and upward trajectories of newer headlamp technologies (Xenon, LED), the tungsten-halogen headlamp continues to dominate the global market. This dominance will gradually decrease over the next five years, but will remain significant long beyond that timeframe.

Chapter 3 OEM suppliers

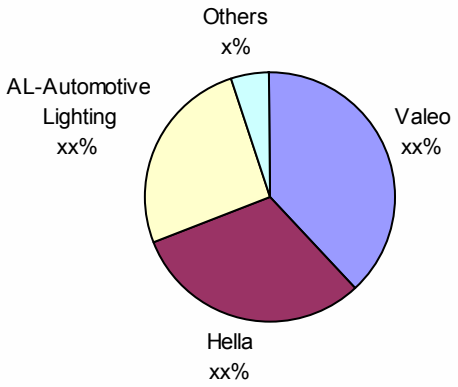
Magna's absorption of the AutoSystems-Decoma and Wagner OE lighting operations, both with a long history of supplying low-cost lighting devices to North American automakers, has meant the consolidation of a leading share of the North American market. At the other end of the scale, the increase in local construction of Japanese-brand vehicles and the rise of premium vehicles from North American brands have boosted the market strength of NAL and ValeoSylvania. A significant share of new GM business has lifted AL-Automotive Lighting to an unprecedented xx% share, while also propelling an increase in local share for Hella, which targets an xx% NAFTA market share by 2010.

Figure 17: Market share of primary front-lighting suppliers to North American-built vehicles by value, 2007 (%)



Source: *just-auto*

Figure 18: Market share of primary front-lighting suppliers to European auto manufacturers by value, 2007 (%)



Source: *just-auto*

Guide's departure and Visteon's restructuring buffet NAFTA market

Guide Corporation was General Motors' lighting division for many decades. After being spun off as an independent company in 1999, Guide remained GM's primary lighting supplier; as of 2004, Guide's significant share of the NAFTA lighting market was a logical extension of GM's significant share of the NAFTA vehicle market. Guide remained nominally viable primarily due to GM's demand for large volumes of simple, legacy-technology lighting devices. The Chevrolet- and GMC-branded GMT800 trucks, for example, were equipped with Guide lighting and provided a reliable annual volume upwards of xxxxxxx pieces.

However, Guide won not a single contract from any vehiclemaker other than GM. Despite ongoing heavy subsidies from GM, a well-intended but financially unfeasible turnaround effort after a takeover by Palladium and a subsequent re-takeover by GM's wholly-owned BBK group, Guide was not able to compete when faced with the open market's demand for high levels of technology, precision, appearance, innovation and performance in automotive lighting devices. In 2006, Guide's operations were terminated. The significant bulk of GM's lighting devices are now supplied by AL-Automotive Lighting, Hella and, in the premium vehicle sectors, North American Lighting.

A different but equally significant series of events reshaped Visteon, which for many years was Ford Motor Company's lighting and interior components

division. Like Guide, Visteon was spun off as an independent company in the late 1990s, and continued as Ford's primary lighting supplier via the production and engineering facility at Sandusky, Ohio. A prolonged fall in Ford's fortunes and costly, difficult labour relations made the Sandusky facility unprofitable, and it was sold back to Ford, together with xx other unprofitable Visteon facilities. Visteon no longer has any significant vehicular lighting device operations in the US or Canada. Research and development is now located in Europe, with several star engineers and researchers having been hired away from other established European automotive lighting manufacturers, while manufacturing centres are located in Mexico and throughout Western and Eastern Europe.

Visteon's withdrawal from the US and Guide's liquidation have had severe repercussions on the North American market. The same factors that made the Sandusky facility unprofitable for Visteon are making it unattractive to potential buyers and investors, and costly for Ford to run. Nevertheless, it is effectively forced to keep the plant open as a wholly-owned production facility. The market substantially retains its volume, but with the two main suppliers gone, there is no automotive lighting manufacturing capacity to spare in North America. This has significantly increased sourcing cost and logistical difficulty for NAFTA market players long accustomed to having easy access to low-cost headlamps and other lighting devices. All the major lighting suppliers actively operate facilities in China and other developing nations, but burgeoning local market demand is occupying most of the regional top-tier capacity. As a result, obtaining production volumes of key types of lighting products with acceptable and consistent levels of quality from those countries largely remains prohibitively difficult for North American and European vehicle makers. The overall effect is that the NAFTA region is now very much a seller's market for automotive lighting devices, and this is expected to be the case through to at least 2010.

AutoSystems and Wagner are now Magna

Behind Guide and Visteon, North America's third- and fourth-largest homegrown automotive lighting suppliers were AutoSystems and Wagner OE. Canadian-based international auto parts conglomerate Magna International has purchased and assimilated both outfits.