With LED lighting and controls now responding to retailer's needs, the lighting industry looks to be fully entwined with this sector. Dr Geoff Archenhold outlines the latest trends in the world of retail lighting, providing a glimpse of its potential future.

LIGHTING IN RETAIL: WHERE TO NEXT?

Figure 1: Luxeon CoB FreshFocus Technology for various grocery applications

Figure 2: Illuminating bread and pastries using the FreshFocus CoB LEDs

FreshFocus Technology for Bread & Pastries

LED lighting and controls are responding to retailer's needs. The LED industry is now fully entwined with the retail sector providing high quality lighting and innovative controls however the digital lighting revolution is creating new marketing opportunities through VLC and BLE.

The retail lighting market has always been dynamic even prior to the adoption of LED technologies. But retail fashion is moving faster than ever with competition amongst retailers rife, driving the need for innovative LED lighting solutions that can draw customers into the retail outlet, create a good first impression, guide customers through the store, focus attention on specialty products, make prices and instructions visible and easy to read, appeal to the target consumers, make merchandise easy to evaluate, assist in making purchase decisions and provide a pleasant and efficient experience to consumers.

The latest trends in the world of retail lighting provide a glimpse of the future of how lighting and control technologies may influence the retail experience.

LED POWER SPECTRAL DENSITY IS IMPORTANT FOR RETAIL APPLICATIONS

The spectral quality of the LED lighting has a significant impact on attracting, retaining and ultimately enabling a customer sale. In recent years the LED production technology has matured and today LED manufacturers are able to offer specific spectral densities for retail applications.

Lumileds

Lumileds introduced its FreshFocus Technology dedicated to illuminate red meat, marbled meat and fish, bread and pastries with light spectrums that show a range of food items in a highly appetising way. The FreshFocus Technology is part of the LUXEON Stylist Series, Lumileds transformative line of LEDs designed to

provide the perfect lighting environment for fashion retail, fresh food and restaurants. Grocery items are notoriously difficult to light as product colour is a key consumer decision making process to purchase any goods and I certainly know if meat looks brown or if vegetables such as tomatoes look dull I'll skip purchasing them. The FreshFocus Technology has been designed by accentuating the natural colours of fish and meat items by identifying the ultimate colour point to bring out the characteristics of various foods. For instance, LEDs with a cool daylight tone of 6,500K on the black body curve best accentuate the natural colours in fresh fish. For red beef, a below blackbody colour point at an ultra-warm, 2,200K colour temperature makes the reds appear rich and vibrant. Marbled meats appear best when lit with LEDs at a below blackbody 3,500K colour temperature. With below blackbody colour points, a higher colour gamut enables more fully saturated colour depiction.

Table 1: Three new Sharp Mini Zenegata colour tuneable LEDs

Part Number	Footprint	LES (mm)	CCT (K)	CRI (Ra)	Range (Cx, Cy)	Watt (W)	V (V)	I (mA)	Luminous Flux (lm)
GW6NGWKCS06	Mini ZENIGATA Size (15mm x 12mm)	8	1900	92	(0.538, 0.413)	0.9	29	30	80
			3000	94	(0.437, 0.403)	12.8	36.2	350	1,175
GW6NGNKCS06	Mini ZENIGATA Size (15mm x 12mm)	8	1900	92	(0.538, 0.413)	0.7	14.3	50	54
			3000	94	(0.437, 0.403)	6.6	18.8	350	574
GW6NGNKCD06	Mini ZENIGATA Size (15mm x 12mm)	6	1900	92	(0.538, 0.413)	0.7	13.8	50	48
			3000	94	(0.437, 0.403)	6.6	18	350	545

Interestingly, Lumileds state improved lighting has been shown to increase sales and provide a return on investment in about a year because the lighting helps reduce unsold or expired meat that would have typically been thrown away.

The FreshFocus Technology for red meat and fish are available in LUXEON CoB 1208 and 1211 arrays, which produce 2,000 and 2,800 lumens when driven at 900 mA and 1,200 mA, respectively. In addition, linear luminaires such as T5 or T8 equivalent lamps can be created by the LUXEON 3014 LED.

For bread and pastries fresh food applications, Lumileds provides the LUXEON CoBs at a CCT of 2,700K, the LUXEON CoB 1208 and 1211 arrays achieve >100 lm/W efficacy and produce 3,464 and 4,750 lumens when driven at 900 and 1,200 mA, respectively.

Nichia

Nichia offer a range of LED emitters specifically designed for retail applications including Meat (M2), Produce (M3) and White Fabrics (M7). Nichia, known for inventing white LEDs, was originally the leader in Phosphor technology and has combined its position in both to enable high quality emission spectra.

The M2 emission spectra provides a high quality of light specifically on red wavelengths and adjusting the white spectrum colour coordinates to prevent a "yellow" white appearance that can make meat look less vibrant and appealing.

The M3 LED emitter emphasises the primary Red, Green and Blue parts of the emission spectrum to achieve the highest quality of colour under general illumination and is ideal for colour applications such as illuminating fruits, vegetables, flowers and produce.

The M7 LED emitters emphasise the white by adjusting the colour and spectrum to produce vivid whites without the need to use near UV like others achieving the effect using a novel phosphor mix only.

Luminus

Luminus, through its generation 3 CoB LED arrays, demonstrated a leadership in terms of efficacy for demanding retail spot lighting applications by delivering 150 lumens per watt at junction temperatures of 85°C. The range comes in various package sizes covering lumen packages from 1,000 lumens to over 20,000 lumens in CCTs ranges from 2,700K to 6,500K and CRI's of 80 or 90 min. One key area of focus was to ensure tight colour binning of 3-SDCM or less along with AccuWhite high CRI products for multi-colour merchandise and Sensus that creates a purer white light making white objects look cleaner and jewellery sparkle.

Sharp

Sharp has developed the Natural Toning ZENIGATA COB LEDs, which warm the CCT as they are dimmed without the need for complex LED driver technology. Natural Toning technology automatically tunes the colour temperature from 3,000K down to as low as 1,900K as the LED is dimmed. This mimics the behaviour of conventional incandescent sources, which is desirable for instance in hospitality and retail applications.

Natural Toning LEDs from Sharp provide outstanding colour quality, with typical CRIs ranging between 92 and 94 across the dimming range. Warm white and cool white blocks are combined within a single light emitting surface, ensuring uniform colour distribution without the complexity of RGB-array solutions. The spectral fidelity and colour gamut of Natural Toning COBs results in a near perfect reproduction of halogen lamp behaviour.

Intelligent Controls

The use of intelligent controls is going to be a huge trend in retail lighting for many reasons including responding to consumer pressure to reduce a brands impact on the environment, whether it's through the reduction of waste, the use of renewables or a more intelligent approach to lighting stores.

With intelligent lighting systems and controls, it is possible to divide a store into zones and only use the light that is needed in any particular area at a specific time. If no people are in the vicinity, the environment can be dimmed to save energy. These systems also allow retailers to track energy usage across a store and adjust brightness depending on the amount of daylight available.

Figure 3 - Casambi retrofit Tobias Grau flagship store in Frankfurt

The real time nature of the retail environment is now a part of daily life and the use of intelligent tracking systems will allow the retailer to understand consumer behaviours better and predict their shopping habits more accurately enabling improved customer engagement. The so-called 'Internet of Things' connects up mobile devices with passive Bluetooth Low Energy (BLE) beacons in the shop, allowing the retailer to guide consumers around the store and send targeted messages and promotions. Individualised prices are also become a possibility through the analysis of shoppers' previous purchases and the developments of insights over what they may choose to buy in the future.

Data is now intrinsically bound up with lighting. Real-time information can be sent directly to the customer via indoor positioning systems and the LED light network. Useful for communicating product details, discounts and maps, this data is also helpful for staff in terms of managing stock and tracking the impact of changes across the store.

Lextar

Lextar offers a smart location-based service utilising Bluetooth beacon sensors within LED fixtures to create a wireless network that connects to mobile devices. The three main advantages of such a system include:
• Route guidance
• Messaging provision
• User behaviour analysis
The smart LBS system is especially suitable for use in large indoor space such as exhibition venues, shopping malls, museums and airports.

Casambi

Casambi offers a smart control system which uses a Mesh network topology based on Bluetooth low energy.
Casambi have also introduced iBeacon technologies within their modules to enable their partners to introduce fully integrated location based services within their fixtures.
Luminaires with integrated Casambi hardware communicate directly with a handheld device, so there are no wires, and no need to connect to Wi-Fi or install any network hardware. Nor do you need a specialist to install and commission the system – it's designed to be as simple as possible.
Retailers can save their most commonly used lighting configurations as preset scenes, making it easy to adjust lighting for the whole store.
Casambi's technology allows the retailer to incorporate smart occupancy sensors into light fittings and harvesting valuable data about how shoppers behave. For example, movement and location sensors can create 'heat maps' of a store, revealing which areas get the most footfall and when. This data can help retailers better understand how their customers behave, turning the lighting system into an insight tool that can help drive sales.
Casambi has recently helped German luminaire maker Tobias Grau deal with a rapidly changing array of products at its flagship store in Frankfurt with a system that controls over 100 light points, either individually or in groups.

Acuity Brands

Acuity brands have been the leader in indoor positioning systems using BLE and Visual Light Communication (VLC) since its acquisition several years ago of start-up Bytelight.
Acuity is known to have supplied 100 Target stores in the US with an indoor positioning system using LED lights that can provide in-store location information to guests using the Android version of the Target app with select Android phones.

Philips Lighting

Philips have also undertaken proof of concept indoor positioning and marketing solutions for retail applications with their location of a VLC enabled 8,000 square metre Carrefour location in Lille.
Philips claims that its system can pinpoint a product's location inside a store to within 10 to 30 centimetres. Its benefits will include reducing the need for staff to guide people, improving conversion rates on promotions, boosting cross selling and engendering customer loyalty.

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