

INDIA'S FOREMOST MAGAZINE ON THE LIGHTING INDUSTRY

# Lighting India

Vol. 13 No. 6

November-December 2018

## Light for Art

- » Well Done Chap!
- » Lighting is not just a visual aesthetic aid
- » Lighting makes a splash at Budapest's new Danube Arena
- » Photoshop vs Lighting Design Software
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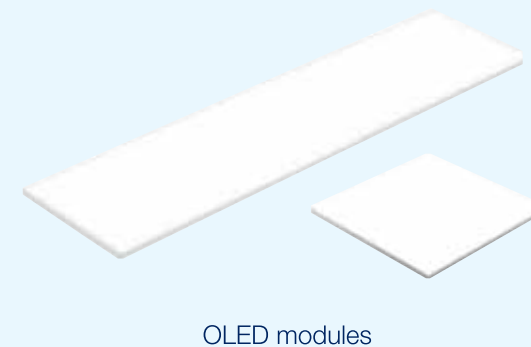
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## LED Driver and modules



## OLED



## Emergency lighting units



## Electronic components



## Controls



## Signage





Indian lighting industry has witnessed a steady growth of over 10 per cent during the past few years primarily driven by strong volume growth thanks to shift from conventional CFL and incandescent lamps to LED bulbs. Today, the lighting market in India is estimated at about Rs 18,000 crore. According to industry estimates, it is expected to be doubled in the next five years.

Further, demand patterns is also undergoing a sea change in lighting industry. As 'smart' products are

becoming an inherent part of the digital transformation of our daily lives, we are witnessing a clear shift towards 'connected lighting'.

Connected lighting, the new buzzword used to describe an intelligent lighting equipment, enables building devices communicate through lighting using controls and sensors harnessing the power of data. It does more than just light spaces. As India is inching towards making its cities 'smart', connected lighting will play a transformative role in this digital age.

Under the program, UJALA (Unnat Jyoti by Affordable LEDs for All), the Indian government targeted to distribute 770 million LED bulbs by March 2019 across 100 cities. However, only 44 per cent or 317 million units of LED bulbs have been distributed so far. The pending distribution volume is expected to boost demand further.

The lack of standardisation remains the LED lighting industry's most vital point of concern. Though LED bulbs are required to have star rating to ensure quality commencing May 2018, the market is still flooded with poor-quality, inefficient LEDs imported through 'grey channel'. This is also contributing to the increased competition and decline in product prices thereby hitting organised players' profitability. The recently announced increased import duty may somehow restrict such import threats.

Do send in your comments to me at [miyer@charypublications.in](mailto:miyer@charypublications.in)

Till then, happy reading!

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Single Issue: ₹ 125 / Annual Subscription: ₹ 750

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Printed, Published and owned by Mahadevan Iyer from 906, The Corporate Park, Plot 14 & 15, Sector 18, Vashi, Navi Mumbai 400703 and Printed at Print Tech., C-18, Royal Indl Estate, Naigaum Cross Road, Wadala, Mumbai - 400 031. Editor: Mahadevan Iyer







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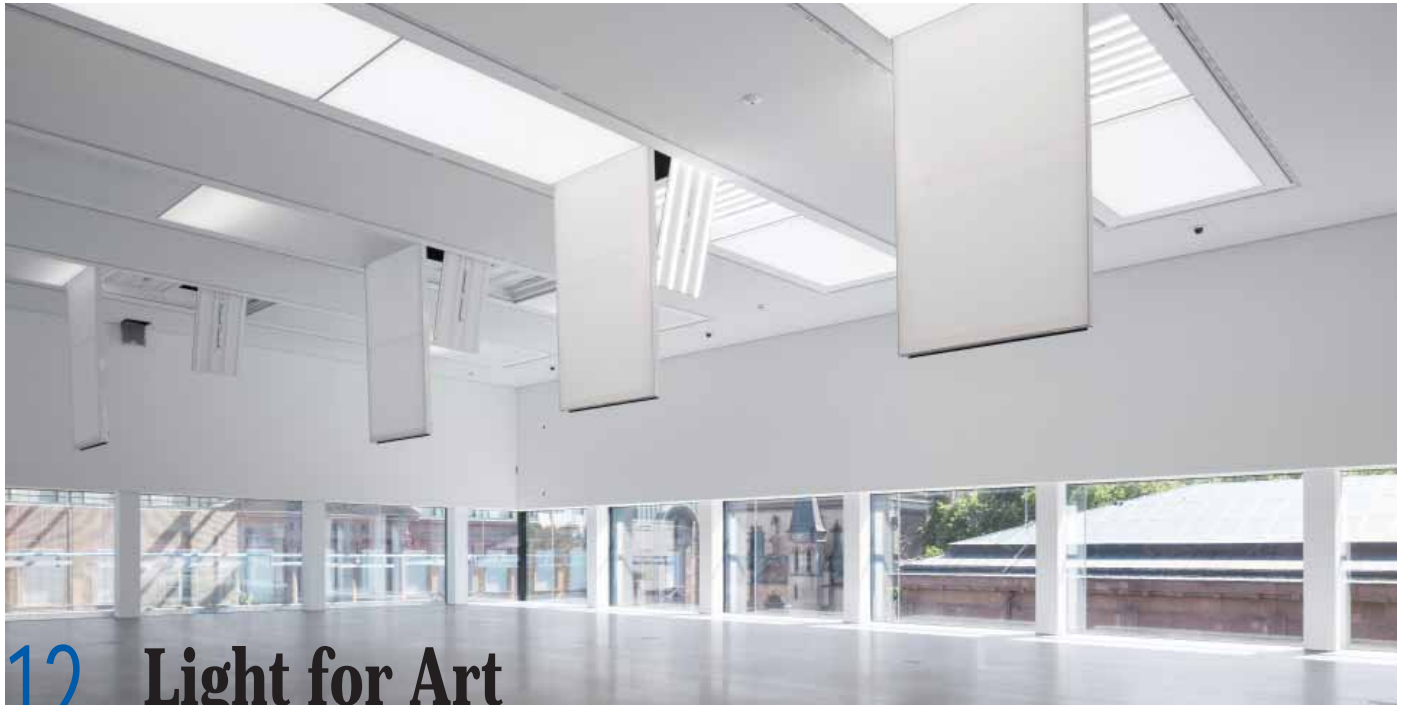
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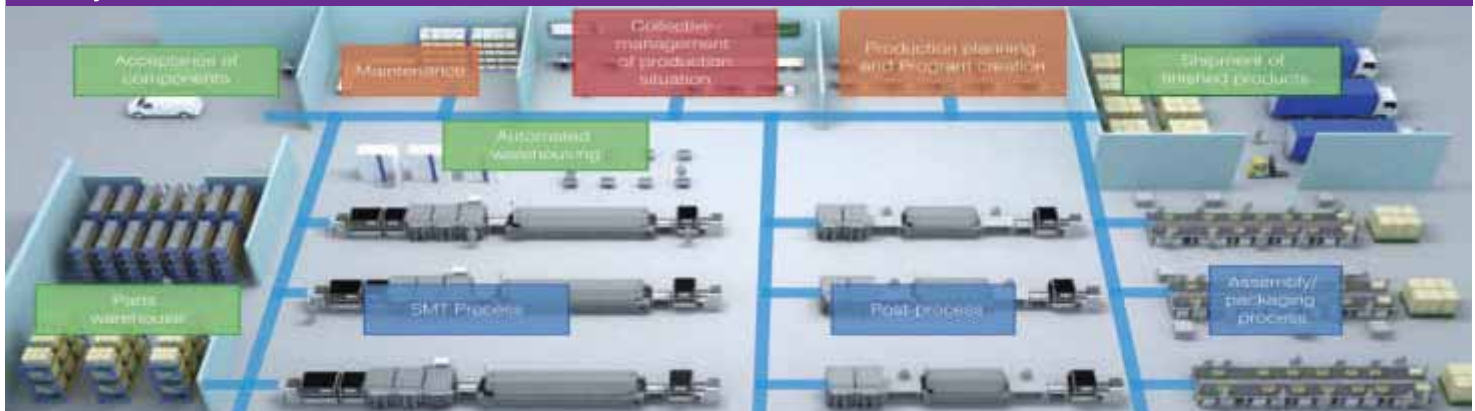
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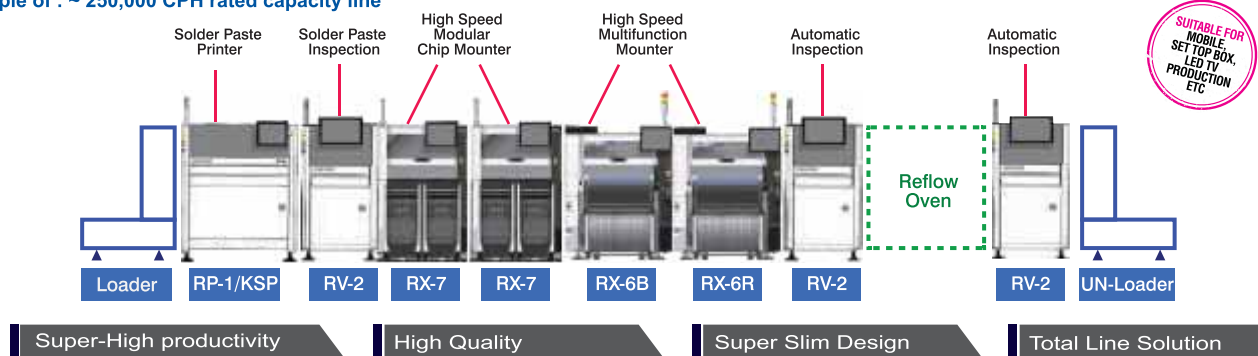
## JUKI Global Smart Solutions

### Factory Solution

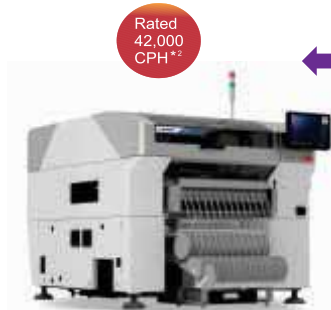


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### RS-1- Fast Smart Moduler Mounter

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## Osram makes car keys superfluous



Osram announced development of Synios SFH 4772S A01 or Synios SFH 4775S A01 that are designed to help the vehicle identify the driver using iris scanning or facial recognition, unlock the doors and even disable the engine immobiliser.

"With these products we are covering a number of different applications and have now succeeded in extending biometric identification to cars. Once more, light-based technology is laying the foundation for innovations in the vehicles of tomorrow," said Walter Rothmund, Marketing Manager Automotive for Emitter Laser Sensor at Osram Opto Semiconductors.

The new Synios SFH 4772S A01 is ideal for use in iris scanning systems. This application is best known at present for unlocking smartphones and tablets without the need for a password. The IRED functions here as a light source, illuminating the iris with infrared light in a suitable wavelength so that a camera can capture an image of the iris pattern – whatever the colour of the eye. The system then compares this information with the stored data and unlocks the device if there is a match. SFH 4772S A01 emits infrared light with a wavelength of 810 nm, which is best suitable for all different eye colours, and achieves an optical output of 1070 mW at 1 A.

The second product, the Synios SFH 4775S A01, is particularly suitable for facial recognition and driver monitoring, among other things. Both these applications ideally require a wavelength of 940 nm. ■

## Eureka introduces contemporary interior LED pendant

Decorative lighting solutions provider Eureka announced the release of its Verner pendant. The "deco-performance" fixture combines high light output with a geometric aesthetic to enhance interior spaces while providing useable light. With no visible hardware, the pendant is intended for use in high ceiling applications, open areas or spaces where diminished focus on the ceiling is the aim.



A new take on a modern yet timeless shape with clean lines and simplicity, Verner's contemporary look is completed with a classic spherical diffuser. The cone-like shade ensures that light is directed downwards and is therefore suited to applications where designers want to avoid indirect light illuminating the ceiling.

Verner is designed for applications where a high output of downlight is required as much as a simple decorative element. Verner's powerful LED light source delivers 2,400 lumens in the standard version and more than 4,200 lumens in the HO (high output) version.

Available in 3000K, 3500K or 4000K, Verner can be cable or stem mounted. The exterior finish can be black or white as standard, while the interior of the shade remains white for optimal light reflection. ■

## LRC develops wireless-controlled warning lights for worker safety

Work zones, accident sites and other roadside incident locations are often chaotic environments where construction workers and first responders are at increased risk of injury or fatality from vehicle collisions. These locations feature flashing warning lights that notify approaching drivers about the potential danger, but rarely provide useful information about visual guidance and at night, can create glare that often makes workers more difficult to see. To address these visual challenges and help reduce risks to roadway and emergency workers, the Lighting Research Center (LRC) at Rensselaer Polytechnic Institute developed a prototype system using wireless communications that allows a user to adjust the intensity, flash frequency, and sequencing of flashing warning lights.



In conjunction with a tablet-based controller using wireless communication and global positioning system (GPS) sensors, the locations of individual lights can be plotted on a map. Knowing their locations, a user can select lights to flash in sequence, for example, to help approaching drivers identify and navigate lane closures. Further, the sequential flashing pattern can update itself in real time if lights are moved as conditions change on the road. Light sensors within the lights can sense ambient light and adjust intensities to lower values at night to avoid creating glare. ■



## Zumtobel opens new space dedicated to light

Signify (formerly known as Philips Lighting), recently launched its new Internet of Things (IoT) platform, called Interact in India, which will enable its professional customers to unlock the full potential of connected lighting for the IoT. The platform delivers new insights to help customers drive operational efficiencies and take more effective decisions. It also supports the company's strategy to deliver new data-enabled services as value expands from lighting products and systems to services.

Launching the platform in India, Sumit Padmakar Joshi, Vice Chairman and Managing Director of Signify's operations in India said, "First, we led the way in energy efficient LED lighting, then in connecting lighting to deliver operational benefits for our customers. Now that light points are smart enough to collect data on their performance and the environment around them, we are tapping into that intelligence. By analysing the data from our connected lights, devices and systems, our goal is to create safer cities, energy efficient buildings and industries and smarter retail stores in the country."

Signify has already installed 29 million connected light points worldwide and plans for every new LED product it produces to be connectable by 2020. This growing number of connected light points, sensors and devices, as well as systems, can collect large volumes of data for which Interact was designed to handle. The highly secure, scalable cloud-based Interact platform uses sophisticated and modern data management and data processing capabilities, including machine learning, to bring sense to all manner of data – creating data-enabled services for customers that will deliver benefits beyond illumination. It also offers a growing suite of licensed open application program interfaces (APIs) which will foster innovation from third-party developers, development partners and customers, enabling various data enabled services to be developed.



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## Zumtobel opens new space dedicated to light



On 13th December 2018, the Zumtobel Group opened its new Light Centre on a surface of 450m<sup>2</sup> at 10 rue d'Uzès in the 2nd arrondissement in Paris. In this new Light Centre, the Zumtobel Group showcases its broad portfolio in the field of professional lighting along with the associated services in the new premises, allowing light to be experienced in its many different fascinating facets.

The centre is based on an open space concept that invites customers to exchange and network. The minimalist concept emphasises the typical architectural aspect of the 19th century building while letting natural and artificial light do their magic. Open meeting spaces promote communication and collaboration with our employees, thus contributing to finding synergies and foster creativity.

In this new Light Centre, the Zumtobel Group presents the expertise of its brands Zumtobel and Thorn in various lighting applications for indoor and outdoor in different exhibition zones. The welcome space with 'Faszinosum' and 'Brandwall', which are characteristic for Zumtobel Group Light Centres, is the point of attraction. Focused product presentations are deliberately avoided and light is shown as a material and as pure matter in a completely brand-neutral way. In this part of the Light Centre, visitors can truly experience the fascination of light. ■

## India announces new ECBC for residential buildings

The Ministry of Power has launched the ECO Niwas Samhita 2018, an Energy Conservation Building Code for Residential Buildings (ECBC-R). The implementation of this Code is expected to push for energy efficiency in residential sector. It aims to promote design and construction of homes including apartments and townships to give benefits of energy efficiency to the occupants. This Code has been prepared after extensive consultations with all stakeholders, consisting of architects & experts including building material suppliers and developers. The parameters listed in the Code have been developed based on large number of parameters using climate and energy related data. Initially, Part-I of the Code, prescribing minimum standards for building envelope designs, has been launched with the purpose of designing energy efficient residential buildings.

The Code is expected to assist large number of architects and builders who are involved in design and construction of new residential complexes in different parts of the country. Implementation of this Code will have potential for energy savings to the tune of 125 billion units of electricity by 2030, which is equivalent to about 100 million tonnes of CO<sub>2</sub> emission.

ECBC for commercial buildings was already in place and revised and updated version of ECBC for commercial buildings was launched in June 2017. It is estimated that energy demand in the building sector will rise from around 350 billion units in 2018 to approximately 1,000 billion units by year 2030. While launching this ECBC-R, Power Minister R.K.Singh stated that building sector will have highest growth in energy demand in coming 10-15 years. Government is encouraging all building professionals including architects, builders to generate awareness towards energy conservation while constructing new residential homes. ■

## TI unveils new LED drivers to help designers reduce power consumption

Texas Instruments (TI) introduced a new family of LED drivers with integrated, independent colour mixing, brightness control and a power-saving mode. The LP5018, LP5024, LP5030 and LP5036 enable smooth, vivid colour and reduce system power consumption.

According to TI, the devices are the industry's first to offer a 29-kHz dimming frequency, above human-audible range, to help designers of applications that use a human-machine interface, such as portable electronics, building automation and appliances, eliminate the noise typically heard when dimming lights. Additionally, designers can achieve smoother colour and brightness-level adjustments compared to standard pulse-width modulation (PWM) solutions, by taking advantage of the devices' integrated 12-bit PWM generator.

Key features and benefits of the LP5018, LP5024, LP5030 and LP5036 LED drivers include high-resolution PWM dimming and ultra-low quiescent current. Also, 18-, 24-, 30- and 36-channel options provide independent colour mixing and brightness control, while three integrated, programmable banks enable simplified software coding and ease of design.

Designers can download LP50xx graphical user interface software to easily configure the LP5018, LP5024, LP5030 and LP5036 LED drivers. Engineers can jump-start their designs with the LP5024EVM and LP5036EVM evaluation modules. ■



## Thailand Lighting Fair witnessed another successful edition



**T**hailand Lighting Fair was held concurrently with Thailand Building Fair and Secutech Thailand from 8 – 10 November 2018 at the Bangkok International Trade & Exhibition Centre. Collectively, the three shows gathered 300 exhibitors from 18 countries and regions and welcomed 10,270 visitors over the three-day fair period.

The 2018 edition of Thailand Lighting Fair adopted a theme of showcasing lighting solutions that are smart, sustainable and human-centric.

Many exhibitors featured lighting that integrated network connectivity and intelligence while applications that promoted energy efficiency and luminance were also noticeable around the fair.

The three shows offered a comprehensive platform of smart and green building technologies that enhanced the

relationship between the various sectors. Fairgoers were provided with new chances to discover overlapping business opportunities within the building ecosystem and witness sustainable city developments in the ASEAN region.

Hubert Duh, Chairman and Managing Director, Messe Frankfurt New Era Business Media Ltd, said, "The 2018 edition of Thailand Lighting Fair witnessed another successful gathering of the lighting community as exhibitors and visitors from Thailand and around the world made their way to Bangkok. We are grateful to those who continue to place their trust in us as the organiser and we were delighted to see the comprehensive range of products, technologies and solutions showcased during the three-day show. Messe Frankfurt will continue to devote itself to growing its presence and creating business connections that serve the ASEAN market." ■

## MaxLite launches Indirect Troffer for architectural interior lighting

**M**axLite introduces the Indirect Troffer as a high-performance LED recessed luminaire that adds comfortable light and architectural appeal to commercial spaces. Ideal for office, education, hospitality, health care environments, the Indirect Troffer uses voluminous, high efficiency reflectors to fill the room with visually comfortable, low-glare, LED illumination. Available as a 2'x2' or 2'x4' fixture to fit standard grid applications, the Indirect Troffer achieves exceptional efficacy above 125 lumens per watt, earning the fixture placement on the DesignLights Consortium (DLC) Premium Qualified Products list. In addition to the energy savings, the light quality and fixture aesthetic are best-in-class for the product tier, the company claims.



"We like to say that our new Indirect Troffer is easy on the eyes in a number of ways," said Director of Indoor Product Management Brendan Drew. The 25- and 32-watt models ship standard with a 0-10V dimming driver that enables smooth dimming down to one percent of full light output. ■

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## Prolight + Sound gets new Director Marcomm



Dr Hendrik Müller

**D**r Hendrik Müller has been appointed Director of the Marketing Communication Department of Musikmesse and Prolight + Sound with effect from 1st October 2018.

Accordingly, he is now responsible for the strategic conception, development and implementation of all marketing and communication measures relating to the company's worldwide activities for the Entertainment, Media & Creative Industries Business Unit of Messe Frankfurt. He reports to Michael Biwer, Group Show Director,

Entertainment, Media & Creative Industries.

After holding various positions in the entertainment and culture business, Müller was most recently Head of Marketing and Sales for the Orchestras and Choir of Germany's Bayerischer Rundfunk broadcasting station. He succeeds Christopher Sparkes who has assumed new responsibilities outside the Messe Frankfurt Group of Companies.

The next Musikmesse and Prolight + Sound will be held in Frankfurt am Main from 2 to 5 April 2019. ■

## Zumtobel Group Supervisory Board appoints CEO Alfred Felder until 2022



Alfred Felder

**T**he Supervisory Board of the Zumtobel Group announces that the contract of CEO (Chief Executive Officer) Alfred Felder, which expires on 30 April 2019, has been extended by three years until 30 April 2022.

With this measure, the Supervisory Board provides for continuity on the way back to good profitability and growth. On behalf of the Supervisory Board, Chairman Jürg Zumtobel explains: "It was an easy and logical decision to extend the mandate of Alfred Felder. Since he took over as CEO in February, he has shown with his enormous commitment, many implemented

measures and significant improvements that he deserves full trust. We are very confident that the necessary changes will now continue to be implemented quickly and consistently."

CEO Alfred Felder emphasises: "In the last ten months, we have set the course for the strategic repositioning of the Zumtobel Group. It is extremely important to me and I greatly appreciate that the Supervisory Board stands behind the strategy and me in the long term. The goal is to make the company shine again. We are now taking further steps of change to complete the stable foundation which profitable growth builds upon." ■

## Bajaj Electricals appoints Anuj Poddar as Executive Director



Anuj Poddar

**B**ajaj Electricals Limited announced the appointment of Anuj Poddar as the Executive Director with immediate effect. In this role, Poddar will be responsible for managing all the business verticals and its operations. He will report to Shekhar Bajaj, Chairman and Managing Director.

Poddar joins Bajaj Electricals from Viacom 18 Media where he was a part of its Leadership Team and was one of its founding team members. During his over 13 years with the company, he has held various senior leadership roles. He joined the company originally known as MTV Networks India and is credited with having crafted its India growth vision and strategy and having spearheaded the formation of the Viacom

18 Media joint venture, as well as having architected the blue print for its very successful foray into mass entertainment with Colors. Over the years, he has played an integral role in the growth of the company, including its expansion into international territories, the acquisition and launch of its motion pictures business as well as its foray into the regional language networks business.

Prior to Viacom 18 Media, Anuj, who is a rank-holding Chartered Accountant, spent nearly a decade with Arthur Andersen and KPMG and was involved in a range of consulting, mergers & acquisitions and assurance services to a range of clients across financial services, consumer, IT & ITES and other sectors. ■



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## Opus – German Stage Award 2019: open for entries

The unique stage setting for Rea Garvey's 'Get Loud Open Air Tour' by lighting and stage designer Christian 'Rocket Chris' Glatthor was singled out for the 2017 Opus Award. In 2018, the award went to designer JoJo Tillmann for his setting for the 'Blossom Tour' of Germany's Milky Chance folktronica band. These are just two examples of the outstanding artistic work behind the use of professional event technology honoured annually by the presentation of Opus – German Stage Award – during Prolight + Sound, the Global Entertainment Technology Show in Frankfurt.

Now, entries are invited for the 2019 Opus Award and outstanding projects by individuals, teams or companies can be submitted at [www.prolight-sound.com/opus](http://www.prolight-sound.com/opus) until 18 November 2018. Until recently, the projects were proposed by an expert jury. Now, thanks to the introduction of an active entry system, a wide range of stage settings, including those by newcomers, have the chance to compete for the award and convince the judges.

The presentation of the Opus – German Stage Award – will take place within the framework of Prolight + Sound on 4 April 2019.

The Opus – German Stage Award – has been given for outstanding achievements in the fields of theatre and stage



Opus 2018 winner: JoJo Tillmann with Michael Biber

productions, live events and open-air events since 2002 and is one of the most coveted awards in the event-technology sector. The conceptual partners of this honorary award are the Professional Lighting & Sound Association of Germany (Verband für Licht-, Ton- und Veranstaltungstechnik - VPLT), the European Association of Event Centers (Europäischer Verband der Veranstaltungs-Centren - EVVC) and Messe Frankfurt. It is given annually in alternating categories by an expert jury comprising association members, experts, journalists and representatives of Messe Frankfurt. ■

## Surya founder, president named 2019 Spirit of Life Award honourees

World-renowned independent cancer research and treatment center City of Hope will honour Surya founder Surya Tiwari and president Satya Tiwari with its highest honour, the 2019 Spirit of Life Award, at an awards dinner on April 7, 2019 in Greensboro, N.C.

For the past six years, Surya has been a financial partner in the City of Hope's efforts to fund new research and medical treatments that have led to therapies now used by millions of people facing life-threatening illnesses around the world.

"My father and I are very honoured to receive this year's Spirit of Life Award," said Satya. "Although we are receiving the award, the real credit goes to the efforts of thousands of our weavers, employees, customers and vendor partners across the world. We look forward to continuing the success City of Hope has achieved in the furniture industry and work to elevate the organisation's visibility within the accessories industry."

The City of Hope Spirit of Life Award is presented to individuals who exemplify the ideals and values that have guided City of Hope for nearly a century, and whose profession and humanitarian accomplishments are worthy of celebration. The Spirit of Life Award, by its very name, represents intangible qualities that make an individual's life worthy of admiration: their generosity, their ability to inspire and their desire to make a difference in the world.

"Your industry support has enabled us to accelerate the



pace of discovery in cancer and diabetes care, transform our understanding of life-threatening diseases and move promising basic discoveries toward actual treatments," said Kristin Bertell, chief philanthropy officer at City of Hope. "City of Hope would not be in a position to change care for patients worldwide if it weren't for the generosity of this industry and companies like Surya that support it."

In addition to its work with the City of Hope, Surya supports several other local, national and international organisations with health and wellness missions including the March of Dimes, Pain Free Patriots, Blood Assurance, Project Mala, and Akshaya Patra for which Satya is an advisory board member. For more information about Surya's social responsibility efforts, visit [surya.com/social-responsibility](http://surya.com/social-responsibility). ■



A power rail into which spotlights can be installed for accent lighting and a ventilation strip provide the outlines of the lighting panels.  
Photo: Andreas Körner

# Light for Art

Mannheim is known as the "city of squares" because of its ordered structure of blocks in a chessboard pattern. Architects Gerkan, Marg und Partner (gmp) took this pattern as the starting point for the design of the extension to the Kunsthalle Mannheim. For this new building they developed the concept of a "city within a city". The space is therefore divided into smaller units with rectangular footprints, organised around a central element – a 22-metre-high atrium. Thirteen galleries are interlinked by bridges, stairs and terraces. These cubes with their individual dimensions and proportions offer a total exhibition space of 3,600 square metres. Some open up to daylight from windows and glazing units, while other appear as introverted cabinets and halls. This means that the curators have a wide range of environments in which they can present all genres of artwork to best effect.

## Variable rooms, flexible light

The various room situations and the fact that the rooms can be changed with partitions means that the lighting concept had to be particularly flexible. The lighting designers from a.g Licht met this challenge with a solution that is not only functional

The lighting in the new extension to the Kunsthalle Mannheim (Mannheim Museum of Modern Art) can be tailored to suit different requirements thanks to the controllable lighting panels in the ceiling and configurable spotlights – anything is possible, from a black box to a white cube for presenting artwork.

Thirteen galleries are interlinked by bridges, stairs and terraces. These cubes with their individual dimensions and proportions offer a total exhibition space of 3,600 square metres.  
Photo: HGESch Photography



Not only the lighting solution itself but also the building systems installed in the suspended ceiling are easily accessible for maintenance purposes. The film frame and the LED carrier are hinged to reveal an inspection opening.  
Photo: HGESch Photography



but also aesthetic. "We opted for lighting panels integrated in the ceiling," said Daniel Walden, the man in charge of the project at a.g Licht. "We could then do without light sources as objects in the room, leaving the clear minimalist architecture of the cubes unimpaired. We used simulations to calculate the dimensions and placement of the ceiling panels so that we could achieve optimum illumination and the greatest possible freedom for the exhibition layouts." A power rail into which spotlights can be installed for accent lighting and a ventilation strip provide the outlines of the lighting panels. Combining multiple functions in the rectangular form ensures that the ceiling remains pleasantly uncluttered.

#### Proven technology, proven collaboration

The ceiling panels were designed and produced by Rentex. This specialist in light ceilings and walls used frames covered with translucent film to ensure homogeneous light in the exhibition rooms. "The laminated plastic film is lightweight, neutral in colour and has high transmittance. It has proven its worth as an excellent diffuser in many other lighting systems for museums and exhibition spaces," said Uwe Jacob from Rentex. Collaboration between Rentex and Tridonic also has a good track record. Uwe Jacob added: "We have already completed a large number of projects using LED technology from Tridonic. The quality of this technology is evident in many different respects in the ceiling panels installed in the Kunsthalle Mannheim."

#### Broad selection of modules, tailor-made configurations

Linear Tridonic LLE advanced LED light engines are installed in the light ceilings. The light engines are available in different lengths and with different luminous fluxes. This variety is important here because it offers the necessary flexibility for arranging the LED modules in the luminaire housings. "The client specified that the building systems in the suspended ceiling should be accessible via the luminaires. The frame with the film and the equipment carrier with the LED modules and LED drivers are hinged to reveal an inspection opening in the back wall of the luminaire housing," explained Uwe Jacob. By combining 24 mm wide LED light engines of type LLE G4 in different lengths and different light outputs and with a colour temperature of 3,500 K, the equipment carriers could be populated so that the light from the ceiling panels was homogeneous. This also means that the braces in the film frame are not visible and do not cast shadows. A linear opal plastic cover, which Tridonic offers as



Large light ceiling panels constitute the main elements of the lighting system in all the rooms for temporary exhibitions on the ground floor and in almost all the cubes on the two upper floors.

Photo: Andreas Körner





an accessory for the LLE, also helps. It ensures that the LEDs do not appear as individual points of light and also protects against contact when the luminaire is open.

### High quality of light, digital control

This demanding project also called for high quality of light, including narrow binning. This means that there are no visible spectral differences between the individual Tridonic modules. This is essential to achieve a homogeneous effect, particularly if, as here, the LED light engines are so tightly packed next to one another. Tridonic technology also ensures colour fidelity of the LEDs when dimmed. The luminous flux can be reduced or increased without any perceptible colour shift. DALI lighting control is used for dimming and switching the ceiling panels. The LLEs are operated on one4all Premium drivers. In addition to various other control options, these drivers include a DALI interface as standard. The adjustable output current of the constant-current LED drivers provides flexibility in the assignment of the LED light engines. Other benefits include particularly low standby power consumption and long life.

### Light for art

Kunsthalle Mannheim claims to be a "museum in motion". Consequently, it does not intend to organise any static permanent exhibitions in the new building. Instead, objects from its collection will be presented in the cubes in new combinations and themes, with ever-changing special exhibitions of works of art loaned from museums around the world. Thanks to the flexibility of the system, the lighting can always be configured to achieve the best possible visual, conservational and staging effects. ■

*"We opted for lighting panels integrated in the ceiling," said Daniel Walden, the man in charge of the project at a.g Licht. "We could then do without light sources as objects in the room, leaving the clear minimalist architecture of the cubes unimpaired."*  
Photo: Andreas Körner

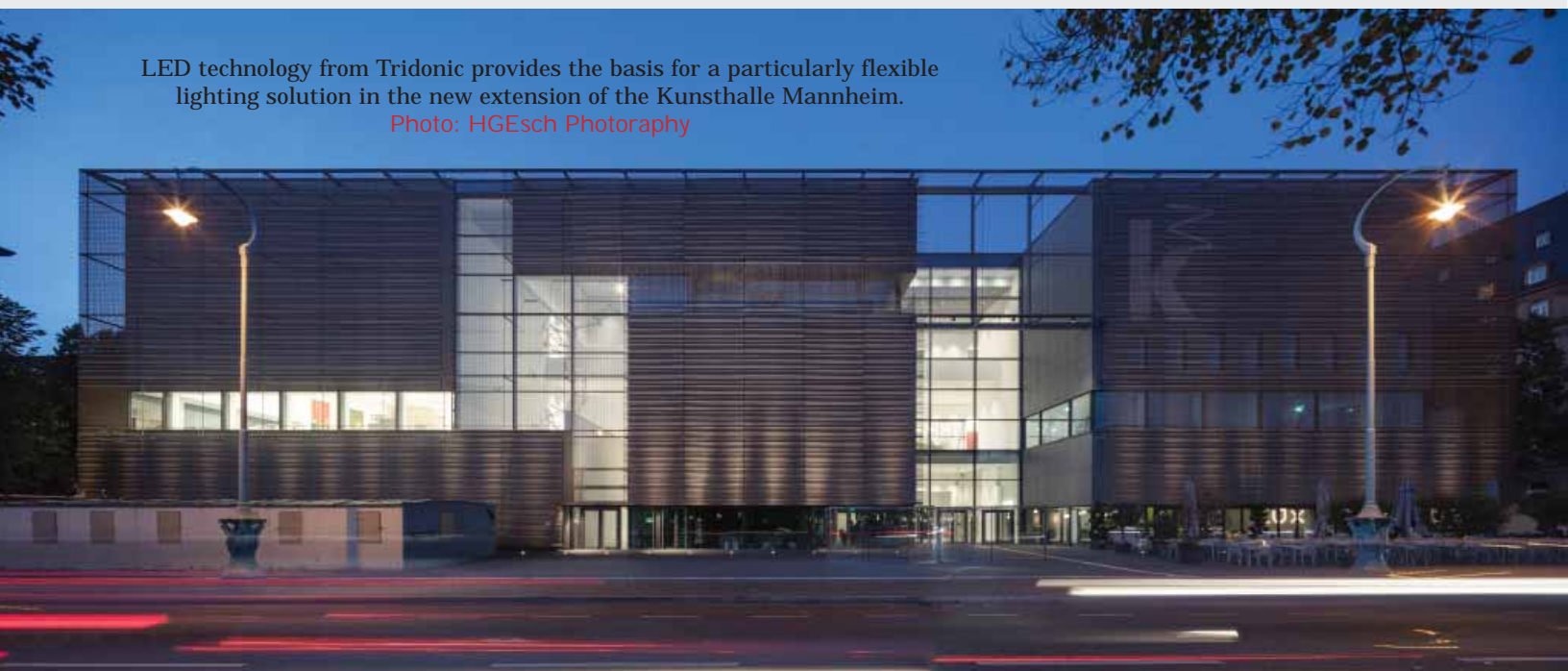


### Project information:

- Extension of the Kunsthalle Mannheim, [www.kuma.art](http://www.kuma.art)
- Architects: Gerkan, Marg und Partner, Hamburg, [www.gmp-architekten.de](http://www.gmp-architekten.de)
- Client: Stiftung Kunsthalle Mannheim, [www.kuma.art](http://www.kuma.art)
- Lighting design: a.g Licht – Gesellschaft von Ingenieuren für Lichtplanung b.R., Bonn, [www.aglicht.de](http://www.aglicht.de)
- Background lighting/light ceiling panels: Rentex Wand- und Deckensysteme GmbH, Eggenstein-Leopoldshafen, [www.rentex-systeme.de](http://www.rentex-systeme.de)
- LED technology for light ceiling panels: Tridonic, Dornbirn, [www.tridonic.com](http://www.tridonic.com)
- Exhibit lighting: Zumtobel
- Facade lighting: iGuzzini

LED technology from Tridonic provides the basis for a particularly flexible lighting solution in the new extension of the Kunsthalle Mannheim.

Photo: HGEsch Photography



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# LIGHTING

in the

# DIGITAL WORLD

The new LED lighting systems can connect and interact with smart controls, networks, devices as well as apps to offer a customisable and tech-enabled lighting experience, paving the way for a fully digital world.

## Ashish Bahal,

Lead Architect and Experience Designer,  
Philips Lighting India



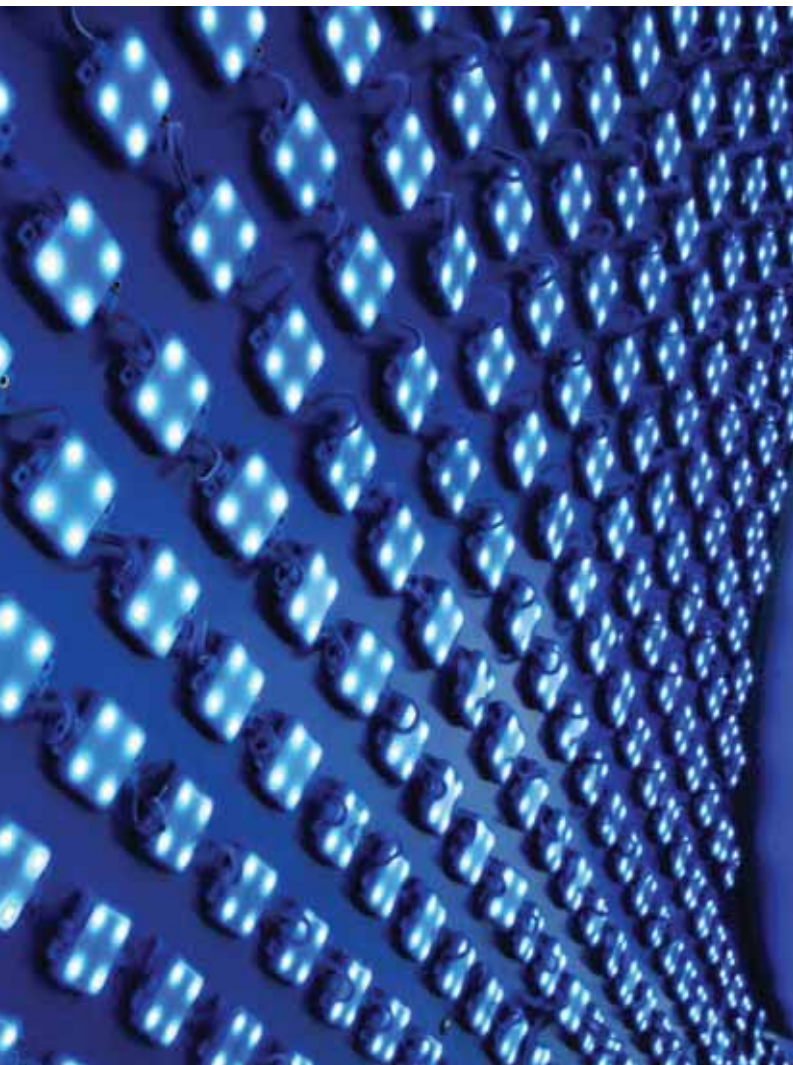
**Q** What's your take on the recent performance of lighting industry?

**A** The Indian lighting market has grown to become a Rs 22,000 crore industry today, with LEDs constituting more than 50 per cent of the overall lighting products sold. Over the past 4-5 years, government initiatives like the UJALA Scheme and Smart Cities Mission have created significant awareness about LEDs and their advantages in terms of energy efficiency. These initiatives provided critical mass for the industry by aggregating demand, which in turn enabled the industry to lower the prices owing to economies of scale. As a result, there has been a rapid adoption of LED lighting across homes, offices, public spaces and cities.

**Q** What's driving the Indian lighting industry?

**A** With rapid urbanisation and growing consumer awareness, we foresee a growing demand for lighting solutions in Indian homes. Consumers are becoming aware of latest lighting trends and designs such as cove lighting, downlighters and indirect lighting, to name a few. Over the past 2-3 years, we have also witnessed the emergence





With the introduction of solid-state technology of LEDs, lighting has become smart and can deliver much more value than just illumination.

of smart homes and smart lighting. Having a 'Smart Home' has become the latest urban dream and choosing the right smart products can transform your in-home experience dramatically.

Additionally, we also see a growing potential for connected lighting solutions in offices and commercial buildings that can help deliver more intelligence to a company's lighting infrastructure. In large offices, our Interact Office system enables employees to personalise the intensity and colour of light at their workstation, thereby enhancing their productivity. Building managers can also get updated information about the efficiency and usage of the real-estate and energy on an hourly basis, wirelessly. Offices can also choose circadian lighting in their premises, that can mimic the natural daylight and boost employee productivity.

Connected lighting also has far reaching benefits for city administrators, as city streetlights can be wirelessly connected and serve as a vital backbone for the city. Our Interact City system enables administrators to remotely monitor and control lights across the city from the control room itself. Faulty lights can be detected accurately

through the GPS technology in the pole, hence repair can be carried out immediately, thereby reducing downtime. Connected streetlights can also monitor air quality, traffic, temperature and noise and feed these to the city administrative office for further analysis.

**Q** How technology is defining your business' future?

**A** We have been talking about connected lighting even before the industry started seeing its potential. The Internet of Things (IoT) is driving transformation in every industry and lighting is no different. With the introduction of solid-state technology of LEDs, lighting has become smart and can deliver much more value than just illumination. Lighting can help make cities safer, buildings more energy efficient, while connected lighting has the potential to make our world even more energy efficient and your home more personal, as it can deliver up to 80 per cent energy savings and enables benefits beyond illumination. At Signify, we are driving this new wave of transformation with our Interact systems for lighting up offices, industries, stadiums, landmarks and cities. Our connected lighting solutions will enable safer cities, productive offices and everyday great home experiences. In a nutshell, we will deliver on our company promise of creating "Brighter Lives and a Better World".

At urban homes, our Philips Hue smart lighting system enables consumers to customise their lighting as per their lifestyle and daily tasks. It has a wide range of light fixtures to suit various design requirements such as Bulbs, light strips, pendants, table and floor lamps and downlighters. The system has pre-set light recipes to help users relax, read, concentrate and energise. It can gently wake them up in the morning, get them energised for the day ahead, and even give them a warm welcome when they arrive home.

**Q** How do you see the future of your industry beyond 2019?

**A** With rapid urbanisation and growing construction activity in both metros and sub-metros, we believe the lighting industry will continue to grow in the country. Rising consumer awareness has also led to the growth of new LED product categories such as downlighters and LED strips.

Over the next five years, we expect that the lighting industry will rapidly transform towards smart and connected lighting. The digital nature of LED technology has brought illumination and IT together, allowing lighting

systems to participate in the IoT. This has led to the emergence of connected lighting, marking a significant shift and transforming lighting from a commodity product to a fully integrated system that can seamlessly connect with a wireless network or Ethernet, allowing users to remotely control and monitor their lighting systems. The new LED lighting systems can connect and interact with smart controls, networks, devices as well as apps to offer a customisable and tech-enabled lighting experience, paving the way for a fully digital world.

Signify foresees that this technology will significantly enhance a consumer's lighting experience at home and drive new business value for professional users. This year we also introduced Light Fidelity (LiFi), a technology in which high quality LED lighting provides a broadband Internet connection through light waves, thereby reducing exposure to an electromagnetic environment, currently caused by radio waves and Wi-Fi. As the lighting company for the IoT, we are the first global lighting company to offer LiFi-enabled luminaires from our existing office lighting portfolio. It will have great applicability in environments that require secure connections such as banks, government offices etc.

**Q** How is green building certification like LEED helping lighting?

**A** The LEED certification is a great step to sensitise the building industry towards energy efficiency as well as

holistic approach while designing green buildings. LEED has driven lighting and allied controls technology to target better operating efficiencies as well as running cost and the carbon footprint likewise. It has also pushed the boundary to renewable energy-based lighting solutions as well as sensitive design approach by reducing lighting pollution.

To add, the PEER (Performance Excellence in Electricity Renewal) system by Green Business Certification Inc. measures performance and improves the regulation, design and operation of sustainable power. It helps energy professionals define, specify and assess power generation, transmission and distribution and provides a framework for continuous improvement.

Likewise, Building Standard has also moved the needle ahead of merely energy efficiency towards human health and well-being. Incidentally, lighting has a profound impact on our mood, productivity and health, making us work more effectively, recover more quickly from illness, and feel better. In addition to visual needs, light also meets non-visual needs of the human body. Lighting design plays a very significant role in defining the quality of a space. Intelligent lighting design solutions consider the functional, biological and emotional effects of light on human beings. ■

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## Taiwan opens new product centre in Chennai

A host of products from varied fields like automation, electrical, healthcare, lifestyle, automobile, engineering, agriculture, and home decor will be showcased

**T**aiwan External Trade Development Council (TAITRA) opened its new product centre in Mumbai, as part of a plan to strengthen its footprint in India.

The centre named as Taiwan Product Centre (TPC) displays a range of products from information and communication technology, healthcare, Internet of Things from Taiwanese companies, a statement said.

Speaking about the launch of the TPC, Alex Pen, Director - Taipei World Trade Centre Liaison Office, Mumbai said, "Opening of the new TPC is a part of TAITRA's efforts to expand business ties with India – Asia's third largest economy. India and Taiwan's bilateral trade is expanding steadily. Taiwan and Indian business cooperation have also become particularly active in the past 2-3 years because with Taiwan's new southbound policy, the focus is on India. Currently, TAITRA is actively offering smart solutions, hardware, software, and electronics among others driving bilateral trade and investment between the two countries."

Several Taiwan-based companies are well known for the smart solutions they have created for various noteworthy smart projects around the world. Taiwanese companies have been seeing great potential in expanding its trade association in the technology space in various sectors like for smart city, pharma, agriculture, food, machineries, ICT etc. Taiwan is keen to share these skills and proficiency with countries like India that are now on the economic forefront with ambitious projects like the Smart Cities Mission. Taiwan has been contributing to various projects of the Indian government

including Smart Cities mission, Make in India, Skills India and Digital India. While there has been a rise in bilateral trade between India and Taiwan in the recent past, TAITRA believes that trading with India has given a great impetus to both countries to build the smart nations. TPC is a strategic move and a step further for smooth exchange of business between the two countries.

At the TPC Mumbai, several renowned Taiwanese brands are showcasing their excellent products. Automation, Electrical and Engineering company Shihlin Electric is displaying a product line related to Factory Automation and Circuit Breaker like HMI, Servo Motor, VFD, MCB, MCCB, RCB, Magnetic Contactors, Relay, Temp Controller etc. Automobile giant KMC Chains have put up products like Motorcycle Chain, Motorcycle Sprocket, Timing Chain. Healthcare & Engineering leaders Magtech Magnetic are displaying Permanent Magnets, Ferrite Magnets, NdFeb Magnets, SmCo Magnets, Alnico Magnets, Plastic Magnets, Flexible Rubber Magnets, Minus-Ion Magnets, Bio-Magnets, and Magnetic Holder & Applications & Energy Converter etc.

Passive Components giants Emtex Co. Ltd are displaying EMI Filter, Power Inductor, Low Profile Power Inductor, Chip Inductor, High Frequency Chip Inductor & Multilayer Chip - Chip Bead Inductor. Last year, an India centre was launched in Taipei to promote awareness about India's business ecosystem in Taiwan. TAITRA also opened its new office in New Delhi in May this year. It already has offices in Mumbai, Chennai and Kolkata. ■



# Well Done CHAP!

According to a Global Market Insights report, the vertical farming industry (both indoor and outdoor applications) is expected to grow from revenue of \$2.5 billion US\$ in 2017 to \$13.9 billion USD in 2024. Seeing this opportunity, CHAP (Crop Health and Protection) has set-up a new Vertical Farming Development Facility in Selby, North Yorkshire to propel commercial urban farming success in the UK.

The state-of-the-art research facility, located in Selby, North Yorkshire, is designed to help entrepreneurs, growers and investors gain deeper insight into the technology and environmental parameters needed to optimise crop yields before breaking ground on their own vertical farming operations. The facility was developed in partnership between the CHAP and Stockbridge Technology Center (STC). It leverages Arize horticultural lighting solution offered by Current, Powered by GE.

"The new facility is designed to support the growing market trend. By testing the latest technology and approaches relevant to this production model, the STC will improve the industry's understanding of ideal indoor farming crop light requirements and growing conditions," an official statement said.

Potential investors and vertical farmers can work with STC's plant scientists and vertical farming experts to identify and test the perfect vertical farm setup to maximise their planned harvest's size, nutritional value and visual appeal. In a controlled environment, they are able to monitor and tweak parameters such as the length of the growing day, CO2 concentration, humidity, nutrients and temperature, to ensure that their proposed farm will be commercially sustainable prior to construction. The resulting data supports business planning activity and minimises risks previously

associated with vertical farming.

This "farm of the future," built by systems integrator GrowStack working in conjunction with TCE Electrical Ltd., is the latest research initiative to be led by CHAP and STC, a pioneer in experimental and applied horticulture research since the 1950s. Since its inception, STC has acted as a bridge between academia and commerce, sharing valuable research and insight that has helped to revolutionise farming practice in the UK.



The installation contains two identical grow rooms - a total growing area of 228 sq.m. - with full climate control and a recirculating hydroponics system as well as futuristic propagation and germination rooms. Four tiers of cropping racks are lit by 780-metre of Arize LED lighting, delivering a balanced spectrum of red and blue wavelengths that will help boost the development of a broad range of plants.

"As cities' populations grow at an exponential rate, the demand for fresh produce grows as well," states Dr Rhydian Beynon-Davies, head of novel growing systems at STC. "We have the potential to grow more produce at an industrial scale within our cities and the focus of this new facility is to support the growers who are taking this bold step into the future of farming. By developing controlled environment grow systems integrated with LED lighting, we can demonstrate how, through technology, urban farming can improve the supply and nutritional value of food in a way that is commercially viable."

#### Shining a light on the potential of urban farming with Arize

"Over the years, Stockbridge Technology Centre has been at the forefront of innovation, devoted to

one of the most fundamental industries in the UK - that of feeding the population," comments Malcolm Yare, Horticulture Business Development Manager for Current by GE. "Light is critical to the success of any crop and by focusing on combining the most effective wavelengths with the optimal environmental conditions, we can help growers outpace traditional methods by creating more 'farmable space' in industrial and urban areas, increasing global harvests in a way that is both commercially and environmentally sustainable."

The Arize range of horticulture solutions has been developed based on Current by GE's experience in intelligent, connected industrial lighting, combined with



extensive research and collaboration with horticulture and agriculture experts. The lights have been designed for easy, plug-and-play installation and are also fully sealed and IP66 UL Wet rated for easy cleaning in high-care, cleanroom environments. Arize lighting is one of the most energy-efficient solutions on the market, using less energy to power the LEDs and generating less heat to tax the facility's cooling systems. With a 36K-hour lifetime (L90) and five-year warranty, the horticulture lighting solutions allow growers to amortise their capital expenditure over a longer period for greater return on investment. ■



# Lighting is not just a visual aesthetic aid



We like to reveal the making and coming together of our design elements as well as the functioning and working of the design through lighting.

**Kayzad Shroff,**  
Founder Partner, SHROFFLEoN

Headed by Kayzad Shroff and Maria Isabel Jimenez Leon, SHROFFLEoN is a Mumbai-based architecture, landscape and interior design studio. According to Kayzad, every great design is an outcome of team effort and collaborative approach. It is never a one man's job. He adds, "We tend to highlight our design parameters with lighting." Excerpts from his interview with Lighting India:

**Q What sparked your interest in lighting?**

**A** Initially lighting for me was more about lighting up a space, a basic requirement to be fulfilled. But as our design complexity evolved, we discovered the power and potential of lighting. The realisation that with the use of lighting you can completely change how a space is perceived is what sparked our interest in it.

**Q What made you take lighting more seriously and make a career out of it?**

**A** When we started accentuating material textures with lighting, we realised we wanted to explore it more because the effects were dramatic and the possibilities seemed endless. The right intensity and direction of light can be used to enhance or downplay design features. You can perceive planes differently. There can be highlights and shadows and you can see depths.

**Q Are you self-taught or did you study lighting design?**

**A** Self-taught. I would rather say that our design experiments taught me.

**Q What's your lighting designing philosophy?**

**A** We like to reveal the making and coming together of our design elements as well as the functioning and working of the design through lighting. In our project "The Orange Extension", we highlighted the corten steel joints with lights where the joinery detail with different sizes of grooves juxtaposes with a designed pattern of lighting. The lighting wasn't just to light up the canopies but reveals the construction details and functioning of the extension. The lit-up joint lines highlight the functionally needed surface drainage channels on top of the canopies. The lights celebrate the channelling of rainwater into a collection plate, from where it's discharged ceremoniously into the adjoining flower bed.

Pool embedded with 1500 fiber optic lights enhancing the atmosphere post sundown





Lit up rainwater drainage channel in corten steel canopy

**Q** How has your work evolved over the years?

**A** We tend to highlight our design parameters with lighting. The change in intensity and colour of lights adds a dimension to the planes of materials and textures and also tunes you to the mood and ambiance with the change in program. Be it architectural or decorative lighting, we used to work on multiple small light pockets within a space. Now we intend to make larger cleaner moves.

**Q** How is your work received internationally?

**A** We have been very grateful to have our works received so well on international platforms. Our project "The Orange Extension" was pre-selected for taking part into the sixth DOMUS international award's for restoration and preservation competition. "Aurelia-House Under A Pool" brought home an amazing second place in the category of the most innovative swimming pool at the swimming pool and wellness event organised by Piscine Global Europe at the Eurexpo in Lyon, France. In both the projects, lighting played an important role in highlighting

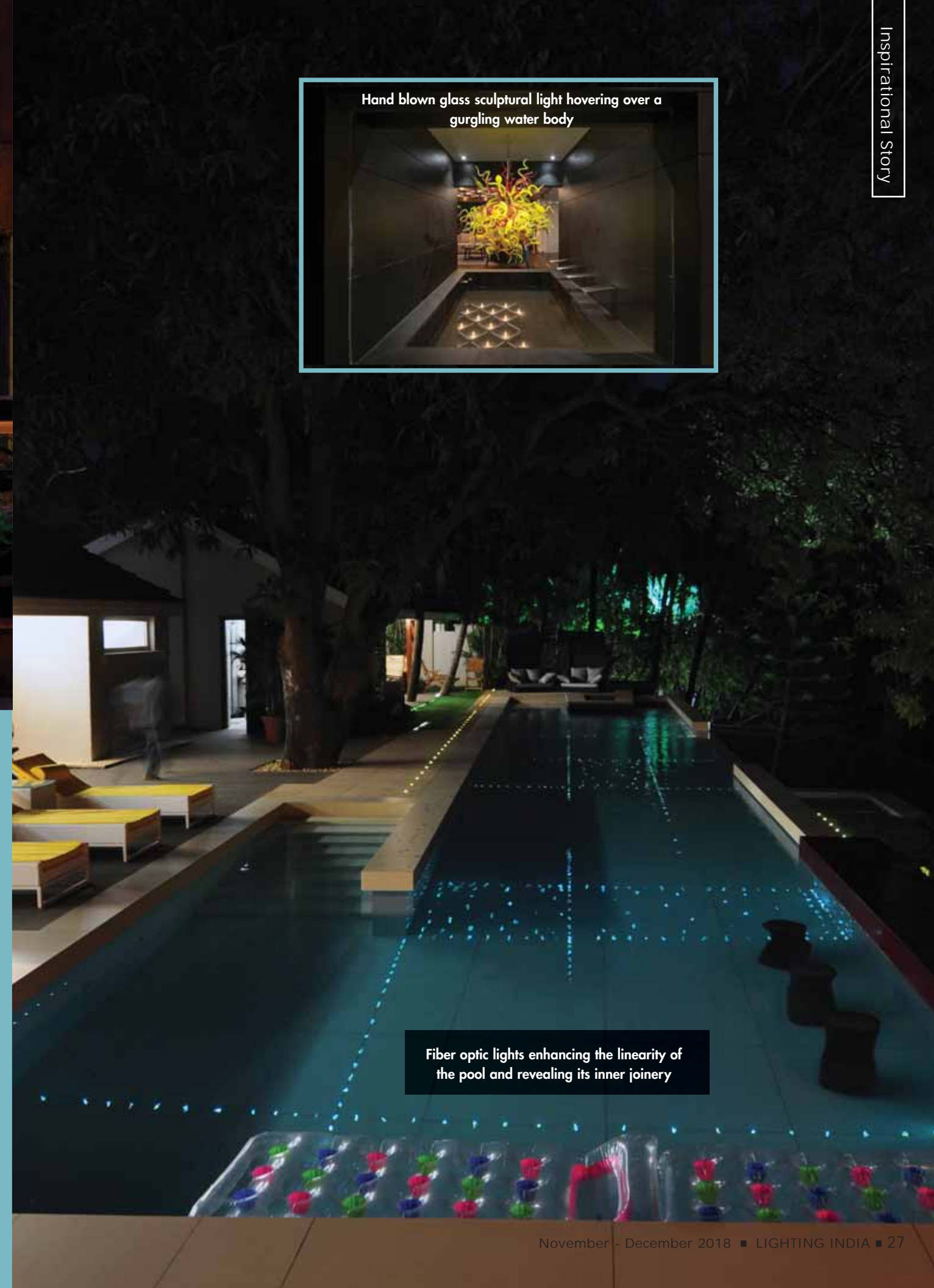
the form of the design. This level of international recognition is very motivating.

**Q** What is the biggest lesson that you have learned since you started your company?

**A** We were always schooled that there is one creative genius behind every project. But ever since we started practicing, we realised it's not true. Every great design is an outcome of team effort and collaborative approach. It is never a one man's job. Our projects benefit from our association and collaboration between our team members and consultants. Having an efficient and effective team is extremely important in the making of an impactful project.

**Q** What advice would you give to young lighting designers?

**A** Lighting is not just a visual aesthetic aid. Always try to bring a balance between functionality and style. Understand the power of lighting and its role as an integral design tool. ■



Hand blown glass sculptural light hovering over a gurgling water body

Fiber optic lights enhancing the linearity of the pool and revealing its inner joinery



# Lighting *makes a splash* at Budapest's new Danube Arena

Thorn and Zumtobel helped create a state-of-the-art sports lighting solution for the latest addition to Budapest's cityscape.

**T**ime pressure is a fact of life on big lighting projects. But for the new Danube Arena in Budapest, the schedule was extra tight – after a major aquatics event decided to relocate at the last minute.

The state-of-the-art water sports venue on the banks of the River Danube had to be completed in just two years, when the location for the 2017 FINA World Aquatics Championship was unexpectedly changed from Mexico to Hungary.

It includes two full-size swimming pools, a diving pool and a training pool, and can host up to 15,000 spectators. The arena's lighting was designed by local practice BE LIGHT!, using products from Thorn and Zumtobel, who were involved with the project right from the planning stage. To meet the high standards required for the project – especially the demands of HDTV broadcasting – BE LIGHT! decided that the lighting system for the Danube Arena needed to be LED. In fact, the arena is believed to be the first sports venue in Hungary to be lit predominantly with LED.

Zoltan Morvai, CEO of BE LIGHT! said: "A lighting system had to be designed and implemented which both had to meet the requirements of the world-class event and, after the event, had to perform economically in everyday life."

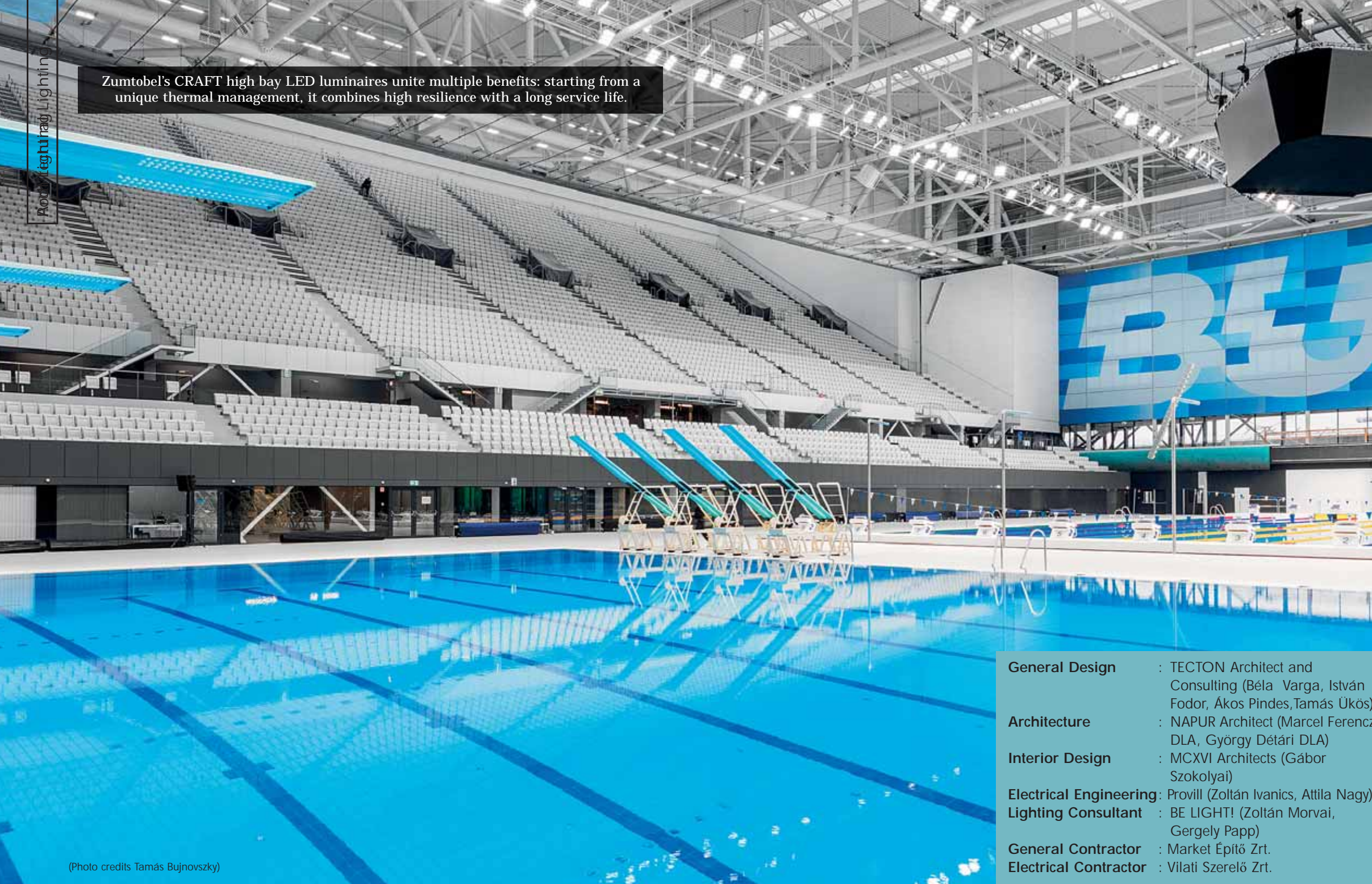
Efficient CRAFT LED luminaires from Zumtobel are installed above the training pool inside the Danube Arena.



(Photo credits Tamas Bujnovszky)



Zumtobel's CRAFT high bay LED luminaires unite multiple benefits: starting from a unique thermal management, it combines high resilience with a long service life.



(Photo credits Tamás Bujnovszky)

<b>General Design</b>	: TECTON Architect and Consulting (Béla Varga, István Fodor, Ákos Pindes, Tamás Ükös)
<b>Architecture</b>	: NAPUR Architect (Marcel Ferencz DLA, György Détári DLA)
<b>Interior Design</b>	: MCXVI Architects (Gábor Szokolysai)
<b>Electrical Engineering</b>	: Provill (Zoltán Ivanics, Attila Nagy)
<b>Lighting Consultant</b>	: BE LIGHT! (Zoltán Morvai, Gergely Papp)
<b>General Contractor</b>	: Market Építő Zrt.
<b>Electrical Contractor</b>	: Vilati Szerelő Zrt.

The main pools are illuminated with 280 of Thorn's Altis LED floodlights, while the training pool uses 200 CRAFT high bays LED from Zumtobel. The entrance and common areas use 569 of Zumtobel's PERLUCE ceiling luminaires. Altis LED from Thorn features a flexible optical system that can be optimised for different applications, and it is highly controllable, enabling instant light

and even dynamic lighting displays. Altis LED's lightweight, compact design keeps structural costs down.

CRAFT high bay LED luminaires unite multiple benefits: starting from a unique thermal management, it combines high resilience with a long service life. The light's inner workings and appearance have been designed from scratch – this was the only way to

make CRAFT achieve its outstanding efficiency level.

Particular challenges for lighting the arena included the requirements for homogeneity on the vertical and horizontal planes, flicker-free light at a specific colour temperature of 5700K to support HD broadcasting, the very high ceilings, and the need for products to be able to resist high

ambient temperatures and moisture in the air. Fittings also needed strong chemical resistance for use around the chlorinated pools. The lighting system for the whole arena is digitally controlled, with a total of 15,000 digital addresses – as many as the number of spectators the arena can hold.

Despite the demanding requirements – not to mention the

tight deadline – the project has been a big success.

István Zentai, technical director for the FINA World Championships Budapest, said: "The Danube Arena was planned and constructed in a very short timeframe for a particular event. What's really wonderful is that, in that short time, the team managed to create something that not only

performed brilliantly at the World Championships, but that will stand the test of time for decades to come. Lighting is a key part of this. This building shows how light can be the most important building material for architects. The team combined creativity, technology and a lot of hard work to get it just right. They have created something very special, that Budapest can really be proud of." ■



Altis LED floodlights from Thorn illuminate the two main pools of the Danube Arena.

Digitally controlled, the Altis LED floodlights from Thorn provide instant lighting and dynamic lighting scenarios.





HAVELLS: LEVERAGING ON

# FUTURISTIC TECHNOLOGIES



Apart from strengthening our footprint in smart lighting segment, we are working extensively on Connected Lighting.

**Anil Bhasin,**  
**President, Havells India Ltd**

**H**avells India, an electrical goods manufacturing major, plans to stay ahead in the race with its latest PoE technology that enables integration of lighting as well as HVAC, building automation and fire-fighting systems. In an interview with **Subhajit Roy**, Havells India's President **Anil Bhasin** shares his thoughts on this advanced technology and how Havells is gearing up for it. Edited excerpts:

**Q** Mr Bhasin, could you brief us on your recent performance vis-à-vis overall industry performance?

**A** Today our focus is on energy savings in lighting. So, for us, whether the industry demands picks or not, we have a huge scope of changing the performance of conventional products. When a person comes to know that his operating cost is going to be reduced by 30 per cent, he prefers energy-efficient lights. That is the advantage with us.

Our lighting segment recorded a double-digit growth during the first 6 months of the current fiscal though other product segments faced problems. However, we anticipate more challenges ahead as the country is going to witness general election in 2019 and no one can predict the results now.

Also, there is the growing awareness and acceptance of advanced automation technologies powered by automation. This will drive the growth in future.

**Q** Is CFL bulb a thing of the past for Havells?

**A** Yes, CFL bulb is a thing of the past as far as Havells is concerned. We have already discontinued the production of conventional and CFL lighting products. We are completely focused on LED lights now and have a very strong hold in this segment. Also, we have been very successful in converting our existing CFL users to LED lighting products.

**Q** Today, Connected Lighting and Internet of Things are talk of the town. What are the developments at Havells in this front?

**A** With our commitment to research and development (R&D), we are leveraging on futuristic technologies. Our product innovations in Connected Lighting enable integration of all lighting amenities with other facilities such as telephony, Internet, electricity, HVAC, fire-fighting and building automation using Power over Ethernet (POE).

We also offer a centrally-controlled monitoring system (CCMS) which enables remote-monitoring and scheduled operations of the lights, energy analysis, fault monitoring etc. This can again be integrated to water, sewage and other facility services. In the outdoor lighting segment, our smart street lighting LED solutions help save thousands of watts.

**Q** What kind of technology innovations can we see in lighting?

**A** Apart from strengthening our footprint in smart lighting segment, we are working extensively on Connected Lighting. In this case, a single Ethernet cable will be used for connecting all amenities which will do away with hassles of multiple dangling wires.

Further, we are introducing mood-centric lighting. We also offer outdoor or industrial lighting controls through the iPad.

**Q** Havells is promoting its lighting business aggressively...

**A** Yes, we have been there one step ahead. In fans also, we are the pioneers in decorative and good-looking fans that makes our ceiling beautiful. In a room, our concentration is very much restricted to the four walls whereas the fifth wall which is the roof is also important.

Also, in water purification, we have come up with latest technology. That has been the forte of Havells that we add value for our customers.

**Q** So far, how much Havells has invested in the lighting business?

**A** As I said earlier, lighting is in the centre stage of our business strategy. We have invested more than Rs 60 crore in our manufacturing facility few years back and the capacity is still underutilised. We do not want to spend more on that. But having said that we are spending more on innovations for which we are planning to have a R&D centre in Bangalore.

**Q** Where is the growth going to come from? Retail or commercial?

**A** Both sides are almost similar. Both these segments are giving us good double-digit growth.

Where do you position yourself in the lighting segment?

We are next to the leaders but the kind of pace we are moving, we aim to be a leader within couple of years. That is our vision.

**Q** Apart from R&D, what makes you different from your competitors?

**A** The main differentiation factors are the innovation and talent because we believe one cannot push the old technology to the market for a long period. Further, the distribution channel has always been always been close to our heart. We have a good relationship with clients.





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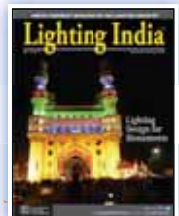
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# Photoshop VS Lighting Design Software

The article explains why right usage of right software is essential when it comes to lighting designing.

Energy is the backbone of any country's economy. With the latest trends across the globe, economies are trying to reduce the energy consumption with optimum usage. Efficient energy consumption also helps to reduce the effects of global warming which is a threat to our mother earth. Huge investments are done and under processing stage by governments and independent bodies such as World Bank, ADB, etc. to explore the new ways of renewable energy resources. The main focus of all countries is to explore the new ways to reduce the energy consumption. Giant multinational companies are trying to provide the new technologies so that energy consumption may get reduce to great extent. In fact, MNCs are providing new platforms such as usage of Wi-Fi, Bluetooth, IoT, technologies for the best result. End-users are also updated about the benefits of using such technologies while finalising their products.

Recently, Light India fair was organised at Pragati Maidan, New Delhi, in which numerous of light manufacturers participate and their presence with their products increase the grace of the light fair with multiple folds. Light India Fair is a platform where designers and manufacturers can interact with each other and have detailed discussions about the latest trends in the current market conditions. Such type of Light Fairs greatly becomes source of huge knowledge. Participants were explaining about their newly launched products.

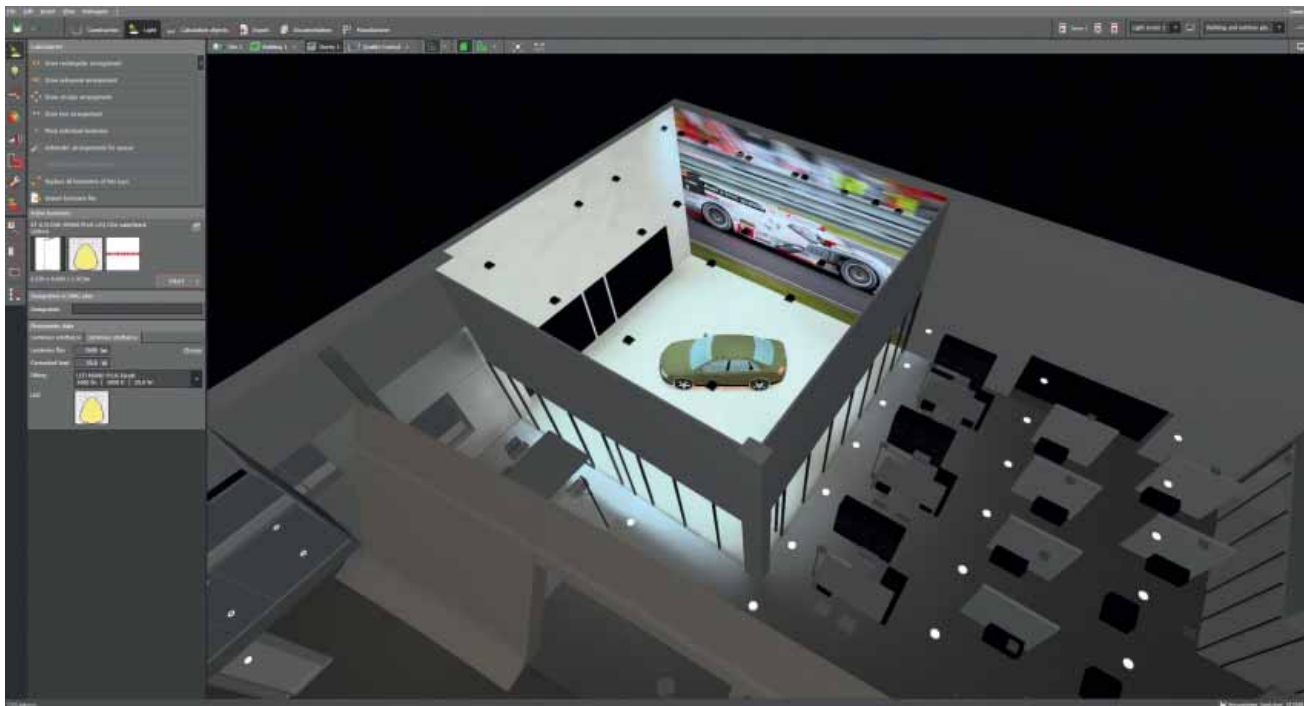
Many lighting designers also participated in the Light Fair. Also, one person who is working on a new start-up on Artificial Intelligence (AI) and Machine Learning (ML) concepts was present at the Light Fair. Both these concepts are used to allow the computer without providing any suitable programming and computer will work according to the analysis of the stored data. These new concepts will be helpful to great extent where computer will execute the decision based on the stored data without any pre-programming.

Generally, it is learnt that lighting designers are reluctant to use software for the lighting illumination design. Many companies have developed special software which can be used for the illumination design of the external as well as internal surfaces. Many such software (such as DIALux 4, DIALux EVO, AGI32, Relux, Radiance, etc.) are available in the market. These software are widely used by the majority of lighting designers across the globe. Some of the companies have provided their software at free of cost while others charge fee to grant licence version of their software.

A student during his graduation time submitted a thesis on: "Comparison Study of Four Popular Lighting Simulation Software Programs (viz. DIALux, AGI32, Relux & Radiance)" in which he tried to explore the largest users of a particular lighting simulation software across the globe depending on number of users, accuracy of results, etc.

It is worth mentioning here that lighting designers are feeling comfortable in using Photoshop software for creating lighting effect. Photoshop software is nowhere related to lighting design. In fact, lighting design provides illumination level requirement as per the site condition, in which illumination at a particular surface can also be obtained. Lighting design using Photoshop software does not provide the different parameters related to fixtures during the design stage such as mounting height, location co-ordinates and projection angle, which are requisite while execution stage of the project.

Also, in Photoshop software, designers are used to create lighting effect by using a photograph. Further, with the arrangement of these modified photographs in form MS-PowerPoint, a movie type effect created which attract the clientele. But such type of illumination designing does not provide the accurate results such as illumination level, total energy consumption, glare level, uniformity of illumination, etc. It is worth mention here that while light illumination is



designed for any building, area or any other place, many factors play important roles to the great extent, such as maintenance factor, texture material/colour, reflectance factors of surfaces (for wall, ceiling, floor), occupancy level. These factors greatly affect the quantities of light fixtures and also the quality of the illumination design. Hence, then how can lighting designers' neglect these factors while designing a lighting illumination by using Photoshop software?

Also, many manufacturers of light fixtures are doing testing of their products either in their own laboratories or from recognised laboratories, to get the photometric data (.ies file) of their products. Such manufacturers are engaged in a partnership with the software developing companies which can help the designers' for using their photometric data during the design stage. These manufacturers are investing huge amount of their profit to get the photometric data, so that designers can use their product data for accurate and optimum design during their design stage for real time simulated result. Also, few lighting software are available with an option to design the light illumination system with the consideration of daylight factor during the design stage, which helps to reduce the energy consumption during day time. Also, light fixtures are available with in-built sensors which can activate the dimming of light fixtures as per the daylight conditions.

Some of the designers categorically claimed that facade lighting is best presented by using Photoshop software and using software such as DIALux EVO, will be critical and it shall be time consuming. It is worth mention here that best quality work comes only after investing time with sincerity and dedication.

Here the application of Photoshop software by the lighting designers is not being criticised. That is their own prerogative. Also, I am not insisting to any designer to use a particular lighting simulation software during design stage.

The moot point is: When beam of light comes out from a light fixture, nobody can predict the direction of light beam and also how will the surface appear when light beam falls on it. Then, how can lighting design using Photoshop can be recommended and accepted by such light designers?

In India, lighting design using lighting simulation software is in neglected stage. Importance of light on human life can be explained with the circadian rhythm. Here, only few people are available to appreciate the benefits of lighting illumination design using simulation software. Many a times, designers submit their illumination design in overcast condition which results huge loss in terms of material cost as well as running cost after the commissioning of the projects. These lighting design software provide the high level of flexibility to designers at the design stage which can help to understand the actual work involvement.

Proper designing with the help of different tools available in the market, help to get the accurate and optimum results. If we design the system correctly, then huge portion of the work get completed because at design stage designer can appreciate the actual work involvement and what may be the futuristic requirement.

### Conclusion

Right usage of right software can further help the designers to design such lighting system which results reduction in energy consumption to great extent as well as reduction in investment. Also, daylight factor cannot be ignored during day time. ■



Author:

Chaudhary Rajneesh K. Singh  
Senior Manager (Electrical),  
Rail Vikas Nigam Ltd



This is the first time there has been a holistic strategy to light up all of central London's bridges. The aim is to create a multi-level visual experience for the bridges viewed by pedestrians on the bridges, from London's riverbanks, from the air, from tall buildings and by boat.

# LONDON CALLING

FOR ILLUMINATED BRIDGES

Image: Overall view of London Bridges.  
Credit: Illuminated River, Leo Villareal Studio, 2018

Signify, formerly Philips Lighting, has been announced as the connected lighting partner to illuminate up to 15 of London's iconic bridges by 2022. The contract was awarded by the Illuminated River Foundation to reinvigorate the city's famous River Thames bridges and further differentiate London as one of the world's most attractive, leading capital cities. Signify won the contract to supply its Interact Landmark system and Philips Color Kinetics LED luminaires to light up the bridges with dynamic, artistic lighting effects via its centrally managed software. In addition, Signify will provide lifecycle services to remotely monitor and manage the connected bridge lighting for the next 10 years.

This is the first time there has been a holistic strategy to light up all of central London's bridges. The aim is to create a multi-level visual experience for the bridges viewed by pedestrians on the bridges, from London's riverbanks, from the air, from tall buildings and by boat. The project is led by the Illuminated River Foundation. It ran an international design competition for the lighting design which was won by the acclaimed, international artist, Leo Villareal and London architects, Lifschutz Davidson Sandilands. Following a rigorous evaluation, Signify was awarded the project because of its global breadth and expertise in lighting and ability to deliver such an important, large-scale, connected lighting project. Also, a key factor was Signify's experience of working with lighting designers and architects on the management of dynamic, architectural lighting scenes.

"Light is one of the most powerful means of breathing new life into leading cities and metropolitan areas, heralding a new era of urban design and beautification. We've lit bridges around the world and seen first-hand the positive impact that dynamic architectural lighting has on transforming local communities and economies. It's wonderful to give the people of London stunningly-lit bridges with some lit up for the first time," said Maria-Letizia Mariani, President of Europe, EVP, Signify.

Phase one commencing now will see four bridges illuminated by mid-2019 with connected Philips Color Kinetics LED luminaires, featured on the world-famous London Bridge, Cannon Street Railway Bridge, Southwark Bridge and Millennium Bridge. Signify's Interact Landmark system will remotely monitor and manage the lighting on all four bridges. For the first time, this will see Cannon Street Railway Bridge illuminated as well as both the tops and undersides of the other three bridges. This will allow far more extensive, three-dimensional lighting effects to enhance the areas surrounding the bridges and facilitate safety.



# Top Five Facts

## about London's Illuminated Rivers project:

1. The Illuminated Rivers project will be the longest public art commission in the world once completed, at 2.5 miles in length, equivalent to 44 football pitches laid end-to-end along 4.5 nautical miles of the River Thames. Interact Landmark system from Signify will centrally manage the new connected lighting for this artwork.
2. More than 22,000 connected Philips Color Kinetics LED light points, capable of displaying over 16 million colours, will be used to create dynamic lighting effects on up to 15 London bridges: London Bridge; Southwark Bridge; Cannon Street Bridge; Millennium Bridge; Blackfriars Railway Bridge; Blackfriars Bridge; Waterloo Bridge; Golden Jubilee Bridge; Westminster Bridge; Lambeth Bridge; Vauxhall Bridge; Grosvenor Bridge; Chelsea Bridge; Albert Bridge; Tower Bridge.
3. **London Bridge:** There's been a bridge on or near this site since medieval times. This commuter favourite has heated pavements designed to prevent ice during cold spells.
4. Millennium Bridge is London's first new pedestrian bridge for over a century and was envisioned as a "blade of light" across the Thames, linking St Paul's Cathedral with the Tate Modern and Globe Theatre on the South Bank. In conjunction with Foster & Partners, the designer of Millennium Bridge, Signify will dynamically light the underside of the bridge for the first time, creating additional light to showcase the blade of light across the river.
5. Every year there are 200 million crossings over the 15 London bridges.

Signify is committed to helping cities to develop eco-friendly business and tourist landmarks. An estimated 50-70% of the annual electricity consumption for architectural lighting is saved by moving to connected LED technology compared with conventional lighting.

Being connected, the lighting will be monitored remotely

by Interact Landmark. The software will detect and manage faults and perform remote diagnostics and maintenance, improving asset management and thereby reducing costs. On the 15 bridges, there will be more than 13,000 luminaires. These will be controlled individually or centrally to create dynamic, unique scenes. ■





## Smart lights shine bright at Light India and EBTI 2018

**W**ith a potential market that is expected to grow more than double in the next five years, manufacturers and inventors are betting on smart and IoT infused lights. The recent edition of Light India and Electrical Building Technology (EBTI) 2018 opened gates to a number of sourcing opportunities with some of the most prominent government bodies and associations making their presence felt during the three-day show.

Light India 2018 and EBTI 2018 brought together the leading names to display a galore of high-tech products and solutions to enlighten and secure the buildings of the future. With 193 companies from five countries and knowledge focused fringe programmes, the shows successfully helped connect different segments of the industry with the right audience.

The country is making an affirmative shift from using conventional lighting to LEDs and energy efficient smart lights. Due to this change, India is perceived as a market with great potential for international and domestic manufacturers alike. Companies exhibiting at the show displayed an array of new technologies and looked satisfied with the overall response received. Ajay Saraf, Business Unit Head, Havells shared: "Light India is the Mecca for lighting companies in the country to display their products. In this edition, there are many companies who have come up with new technologies at the exhibition on display. I see a great future for LEDs with

connected lighting in India and Light India will really take the technologies to the customers in a better way."

Expressing their satisfaction, representative from another industry giant, Raju Bista, Managing Director, Surya Roshni Ltd shared: "The lighting market in India is about Rs 18,000 crore and with this speed it is progressing it has the potential to grow more than double by reaching Rs 40,000 crore in the next five years."

He further added: "As a platform, Light India is extremely beneficial for architects, builders, distributors and the exhibiting companies. I want to congratulate Messe Frankfurt and ELCOMA for this edition of Light India as we have noticed a positive change in every edition of the show with footfall being noticeably good."

The second edition of EBTI showcased that there is great potential for smart and secure building management solutions in the market. Talking about the future of building technologies and the association with EBTI, Bhavesh Doshi, Secretary, KNX India, shared: "As always, association with Messe Frankfurt and EBTI has been fruitful. There is no organised event in India that is focussed only on building technologies and I feel EBTI has a very good future here. KNX partnering with EBTI is looking forward on bringing more solutions in the building technologies sectors. Our association with the show is going to be a lasting one."

The shows also saw many eminent dignitaries from prominent associations like Builders Association of India (BAI), Confederation of Real Estate Developers' Associations of India (CREDAI) NCR, Institute of Indian Interior Designers (IIID) and Engineering Council of India (ECI) who attended the show to get a glimpse of the latest developments that are entering the market.

A total of 9,479 business visitors on the showfloor, Light India and EBTI 2018 provided them a platform for effective discussions, meeting with new associates and trade tie-ups. With every participant talking about high-tech solutions in lighting and building sectors, it is evident that smart and energy efficient is the future. ■





# URBAN LANDSCAPE IS BECOMING A BIG OPPORTUNITY



Authorities and government agencies feel that our outdoors need to be much more inviting to the citizens. On this front, we have launched an extensive range of urban landscape lighting.

**Puneet Dhawan,**

Sr. VP and Business Head (Lighting),  
Orient Electric Limited

**W**ith India eyeing manufacturing capacity of 1.2 billion LED bulbs, lighting industry is expected to see a growth of 13 per cent to 15 per cent until 2020. According to a report by ELCOMA, the lighting industry is expected to reduce energy consumption for lighting from the present 18 per cent of total power consumption to 13 per cent by 2020 by introducing more energy efficient products. The focus has now been shifted to smart lighting. In an interaction with Subhjit Roy, Orient Electric's Sr. VP and Business Head (Lighting) Puneet Dhawan shares his thoughts on what he believes will be the next big thing in the lighting industry and how his company is gearing up for it. Edited excerpts:

**Q** Lighting has evolved from conventional to LEDs. How the business has evolved with this?

**A** Till recently, lighting business or more precisely conventional lighting business

was the forte of 2-3 multinationals who had put lots of research and efforts into product development especially in the field of light source. Control gears required for these light sources was generally magnetic and transition to electronics control gear had started in later stage of conventional lighting era but LED lighting has brought about a change in this during last 5 years and now the light source is no longer limited to so-called 'major' lighting companies. Today, light source is LED and LED manufacturers are not necessarily lighting companies and the major LED source manufacturing companies are not traditional lighting companies. So, one important aspect of lighting – light source has gone beyond control of lighting companies. The other aspect which has come along with LED is the associated electronics because for all LED light sources, there is the need to have suitable electronics drivers. Another competence which is required now is knowledge of electronics design and manufacturing and assembly of electronic components or drivers. These two factors have totally changed the business model of lighting companies. For us at Orient Electric, our electronics competency which we started developing in 2013-2014 by putting up an electronics plant for manufacturing CFL drivers has actually helped a lot in this transition. We were ready with our electronics design and manufacturing of electronics LED drivers much ahead of other lighting competitors and since LED light source was globally available to us on equal footing with other players, we were able to quickly adopt to this transition.

Further, we made significant investment in thermal management technology as it is essential to design a good housing for the LED light source to manage the generated heat well.

**Q** How significant is your lighting business as far as Orient electric as a group is concerned?

**A** Lighting business is the foremost growing business within the company and we are also the fastest growing company in the lighting business within the trade. With evolving consumer needs and strong institutional and government demand, we have positive outlook for the future.

**Q** What is your position in the market?

**A** We are well placed in the B2C business with a double-digit market share. In lamps manufacturing we are amongst the first three manufacturers in terms of quantities manufactured in non-OEM sector. In LED streetlights also, we are one of the largest manufacturers in the country in the non-OEM category.

B2G business, which we started 2 years ago, has given us very good results and we have bagged many B2G

projects in various luminaires in industrial, commercial and street light segments.

**Q** IoT has become the new buzzword. How do you see Orient Electric's preparedness on this front?

**A** Lighting industry is evolving very fast both in terms of technology and the associated cost. The future depends on both: technology has to become simpler and cost has to become affordable for consumers. Otherwise it will remain a niche market. We are evaluating all the options like Bluetooth and Wi-Fi. We should be able to launch common platform for all our products very soon.

**Q** Is it applicable to street lighting as well?

**A** Street lighting is not part of that as it is user specific and tender specific. We have supplied Centralised Control & Monitoring System (CCMS) for remote-controlled and remote monitoring of street lights in Himachal Pradesh and Delhi Cantonment. More than 25,000 lights right now are being centrally-controlled with those systems.

We have now gone for smart city requirements with individual controllers where one can individually control light or a group of lights. We are also working on new product development with dimming options, occupancy sensor and motion sensor. Further, we have recently introduced smart bulb for indoor spaces.

**Q** Did you launch any other new products in the market?

**A** Urban landscape is becoming a big opportunity for spending. Authorities and government agencies feel that our outdoors need to be much more inviting to the citizens. On this front, we have launched an extensive range of urban landscape lighting. We have also launched a range of premium indoor fixtures, chandeliers, wall mounted and ceiling mounted lights.

**Q** You have also launched 5-Star LED bulb. What are its unique attributes?

**A** We were the first lighting company in India to introduce 3-Star rated LED bulbs way back in 2016. In our consistent endeavour to provide value to consumers, we are once again the pioneers to introduce the 9W LED bulbs with BEE (Bureau of Energy Efficiency) 5-Star rating award. This new LED bulb meets BIS safety standards, has long life of 25,000 hours, and delivers 120 lumens per watt. Its unique attributes include: low-glare, fixture-free and 30 per cent brighter than 3-Star LEDs.



After witnessing the Hong Kong International Lighting Fair (Autumn Edition) 2018 and Hong Kong International Outdoor & Tech Light Expo 2018, **Subhajit Roy** reports on what's going on in the lighting world today.

# Hong Kong's Twin Lighting Fairs Continue to Scale New Heights



The 20th Hong Kong International Lighting Fair (Autumn Edition) and the 3rd Hong Kong International Outdoor and Tech Light Expo, organised by the Hong Kong Trade Development Council (HKTDC), attracted more than 44,600 visitors and over 13,600 buyers respectively. Gathering more than 3,100 exhibitors, the twin lighting fairs formed the world's largest lighting marketplace.

HKTDC Deputy Executive Director Benjamin Chau, said, "The increase in buyer attendance showed the three concurrent fairs had been successful in creating synergy to help build an effective cross-industry sourcing platform. The number of buyers from many markets – including the United States, Mexico, Chile, Russia, the Czech Republic, the United Kingdom, Kazakhstan, Indonesia, Vietnam, Malaysia and Korea – saw significant growth."

He also noted that based on an on-site survey conducted at the Autumn Lighting Fair, the industry in general is cautiously optimistic about the business outlook for next

year, while smart city and smart home trends will continue to drive the development of the lighting industry.

## 20th Hong Kong International Lighting Fair (Autumn Edition)

As Internet of Things (IoT) technology continues to gain momentum, it is driving the development of both the smart city and smart home. The Smart Home Gallery made its debut at the Autumn Lighting Fair to showcase smart lighting products from Opplé, Philips and Tuya, as well as a smart platform from Jingxun (a partner of Tmall Genie AI Union) and Yeelight (a Xiaomi Eco-System company). The Smart Lighting & Solutions Zone featured an array of lighting designs, software, management systems and smart lighting design solutions. The fair also featured a Smart Lighting Development Forum, where industry experts discussed the latest developments in smart home lighting and IoT technology.

## Product Highlights

### Opplé's 'smart' lighting solutions

Opplé demonstrated the application of two core technologies - Bluetooth, smart control system in scenarios including office, home, shopping mall, industry and outdoor, bringing the human lighting concept to our customer. During the four-day exhibition, OPPLÉ booth received many professional visitors and overseas customers. Qi Xiaoming, Chief Technology Officer of Opplé Lighting, delivered a speech on 'Smart Lighting and Lighting Ecosystem' at the exhibition forum.



## Move ME LED Bulb by Besselink Licht

Developed and designed by Netherlands' Patrick Zulauf and Paul Besselink, 'Move ME LED Bulb' has a moveable diffuser and reflector. With this invention, a new typology of the LED bulb comes to market with multiplicity variants of movable reflectors or diffusers that direct or divide the light and accentuate the space. This works perfectly for all situations as table, floor, wall, ceiling and pendant luminaire. The product can



be used directly in any E27/E26 socket with 240/120 volt.

## GABIO LED Pendant Louvre

MEGAMAN GABIO LED pendant direct or indirect louvre brings suspended task lighting in a new direction by combining the minimalist design of louvres and the most advanced optical distribution within offices, classrooms, hotel reception and other commercial spaces.



### Features:

- Slim aluminium linear profile
- Louvre cell design with low glare rating (UGR<19)
- Wide batwing light distribution and wide beam angle
- Available in different mounting methods
- Innovative X,L,T connectors with integrated LED
- Louvre cells for continuous line of light, making junction invisible.

## Ecolant's IoT streetlight solution

Korea's Ecolant is a manufacturer of intelligent outdoor lighting solutions. At the 20th Hong Kong International Lighting Fair, the company showcased its IoT street lighting solutions.

Present at the occasion, Young Ho Baik, General Manager of Ecolant, said, "Our IoT streetlighting solution uses a real-time mesh network, IoT sensor triggers neighbouring lights and creates a safe circle of light around an occupant. The adjustment to human presence happens automatically. Interference factors such as small animals or moving trees are filtered out."

### Main features:

- Through IoT technology, achieve remarkable streetlighting energy savings by up to 90 per cent without sacrificing road safety in a comfortable manner.
- Smart streetlight solutions with integrated wireless sensor for presence-based monitoring and control of outdoor lighting applications. "On-Demand" streetlight solutions that lighting levels adjust based on the presence of pedestrians, bicycles and cars.
- In-built monitoring software notifies lamp, driver or communication failures.



## Philips Hue Smart Light Bulb



Philips Lighting displayed Philips Hue that combines brilliant and energy-efficient LED light with intuitive technology. Together, the light, the bridge and the smart controls is expected to change the way you control and experience light.

### Features:

- Personal wireless lighting system
- Control your Hue system wherever you are, with any smart device on hand.
- Set brightness, change colours, create timers etc.
- Hue also offers an out-of-home control for your peace of mind.

## Robot Track - LED Autonomous track light system

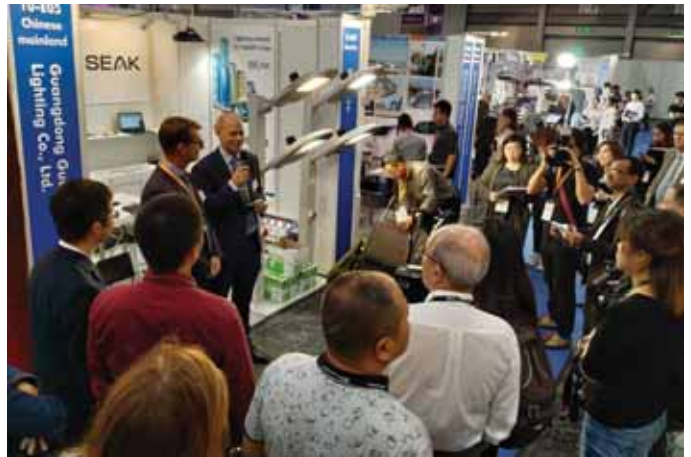


Magtech Industries Corporation displayed its autonomous LED track light that is networked using Lynxus wireless technologies which can be individually or group controlled using smart APP. The user can control these lights to make it turn 355-degree horizontally, 90-degree vertically when the front zooming lens can travel 30mm giving a beam angle from 15-degree to 60-degree. And, there are more – it is colour tunable from 2400K to 6300K. All of these at the push of one control button.



## 3rd Hong Kong International Outdoor & Tech Light Expo

The Outdoor and Tech Light Expo showcased lighting products and solutions for industrial and commercial buildings, outdoor areas and professional venues such as warehouses and production houses. The inaugural Horticultural Lighting Zone presented grow lights for plants in outdoor areas such as farms, domestic gardens and public parks. Various forums and seminars were held during the fair period, focusing on a range of issues such as smart road lights, horticultural lighting and testing and certification services for lighting products to highlight the latest industry trends.



## Product Highlights:

### Transparent LED Wall & Flexible LED screen



Outdoor media got a prominence at this year's International Outdoor & Tech Light Expo. Visual Idea Limited demonstrated its transparent LED wall and flexible LED screen during the expo. It is a transparent LED wall and flexible LED screen with high transmittance and strong perspective. The installation is easy, making it suitable for shop and building exterior decoration and promotion, stage visual effects and arts installation, etc.

### SEAK Smart Light Controller

Slovak Republic's SEAK s.r.o. demonstrated its smart light controller – LUMIMASTER SLC-NOM. It enables autonomous, local and remote management of lighting. This unit in connection with the SLM modulation units, LUMINODE SDM-DIG communication nodes and two-way DALI certified ballasts offers the view of their status.



### Cross-industry Cooperation

Meanwhile, the 13th Eco Expo Asia, jointly organised by the HKTDC and Messe Frankfurt (HK) Ltd, and co-organised by the Environment Bureau of the HKSAR Government, featured nearly 340 exhibitors and attracted more than 14,800 buyers. These fairs offered a one-stop sourcing platform and synergy to provide more cross-industry business opportunities. The three parallel fairs concluded with a record number of over 73,000 buyers from 154 countries and regions – an increase of 6 per cent on last year's attendance. ■

## Event Calendar

### LED China 2019

**Venue:** Shenzhen Convention & Exhibition Center  
**Date:** 21 - 23 February 2019  
**Website:** [www.ledchina-sh.com](http://www.ledchina-sh.com)

### Strategies in Light 2019

**Venue:** Mandalay Bay Convention Center, Las Vegas  
**Date:** 27 February - 1 March 2019  
**Website:** [www.strategiesinlight.com](http://www.strategiesinlight.com)

### Taiwan International Lighting Show Taipei

**Venue:** Taipei Nangang Exhibition Center,  
**Date:** 8 - 10 May 2019  
**Website:** [www.tils.com.tw](http://www.tils.com.tw)

### LED Expo, Mumbai

**Venue:** Bombay Exhibition Center, Mumbai  
**Date:** 9 - 11 May 2019  
**Website:** [www.ledexpo-mumbai.com](http://www.ledexpo-mumbai.com)

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The background of the advertisement is a photograph of a modern office interior. The ceiling is white with a grid of square recessed lighting fixtures. One fixture is shown in a close-up, exploded view, revealing its internal components. The office has white desks, black chairs, and large windows in the background.

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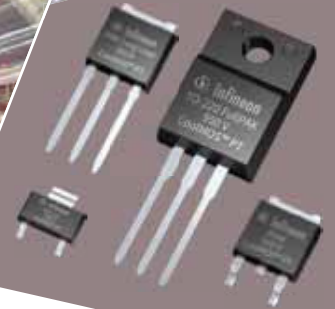
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# 950 V CoolMOS™ P7 SJ MOSFET

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Infineon offers two evaluation boards for thorough testing. Plug-and-play at 90VAC in a 40 W adapter reference design, featuring the snubberless concept, demonstrates excellent efficiency gains of up to 0.2% and lower MOSFET temperature of up to 5.2°C compared to similar competitor technology.

The 950 V CoolMOS™ P7 comes in TO-220 FullPAK, TO-251 IPAK LL, TO-252 DPAK, and SOT-223 packages – allowing for changes from a THD to an SMD device.

## Key features

- › Best-in-class FOM  $R_{DS(on)} E_{oss}$ ; reduced  $Q_g$ ,  $C_{iss}$  and  $C_{oss}$
- › Best-in-class DPAK  $R_{DS(on)}$  of 450 mΩ
- › Best-in-class  $V_{GS(th)}$  of 3 V and smallest  $V_{GS(th)}$  variation of  $\pm 0.5$  V
- › Integrated Zener diode ESD protection up to Class 2 (HBM)
- › Best-in-class quality and reliability

## Key benefits

- › Up to 1% efficiency gain and 2°C to 10°C lower MOSFET temperature, compared to CoolMOS™ C3
- › Enabling higher power density designs, BOM savings, and lower assembly cost
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- › Better production yield by reducing ESD related failures
- › Less production issues and reduced field returns



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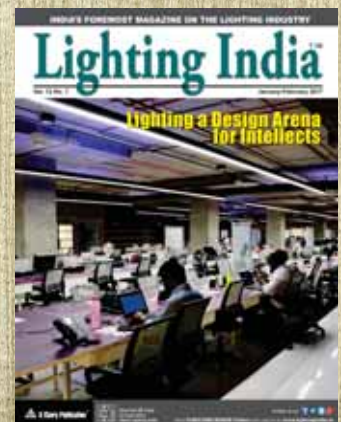
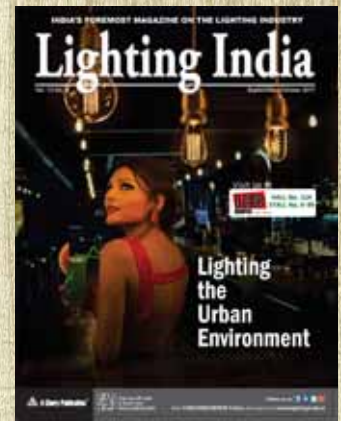
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