VOL.6 Issue 2

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IllumiNation

APRIL - JUNE 2024

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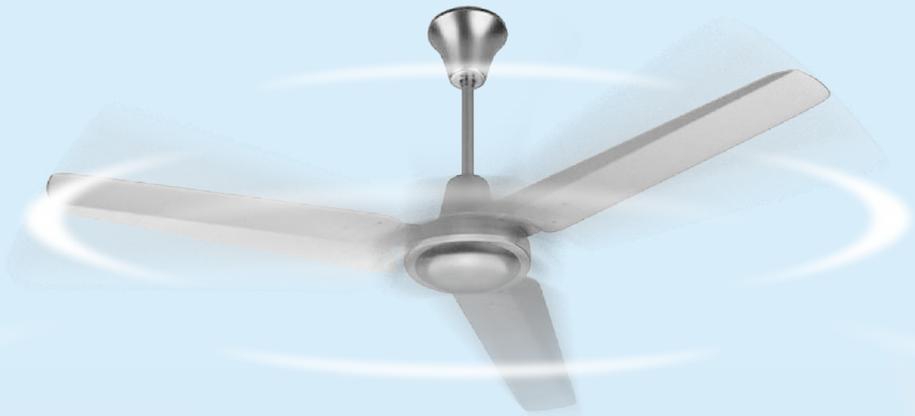

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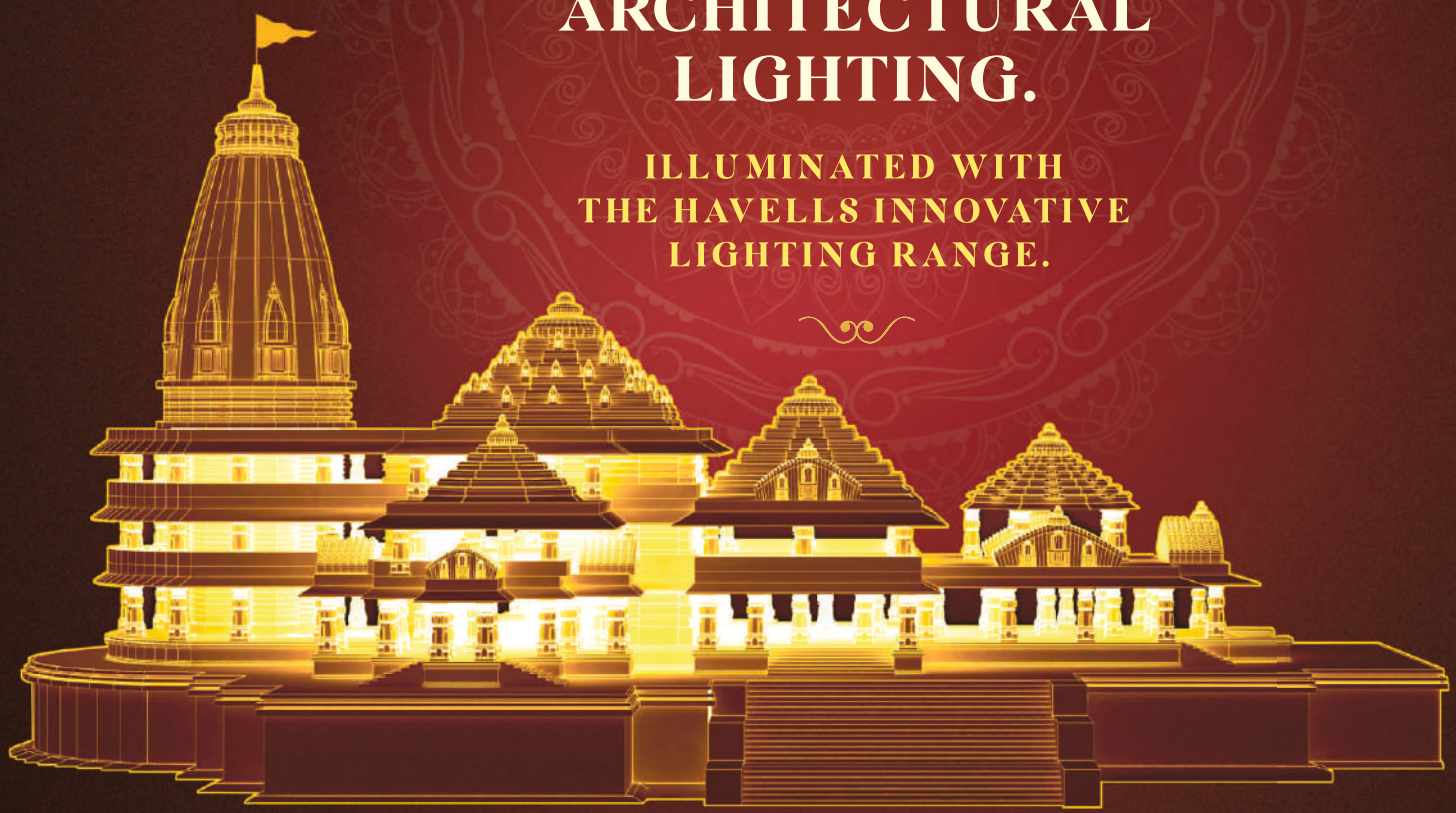

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Strong Growth & Policy Tailwinds

The Indian economy is off to a strong start in 2024, with GDP growth in Q3 FY 2023-24 hitting an impressive 8.4%. This momentum extends to key sectors, with robust manufacturing (11.5%) and construction (9.5%) growth indicating continued demand for residential and commercial spaces, which bodes well for the lighting industry as we enter a new Financial Year.

The Union Cabinet's approval of three semiconductor plant proposals, valued at ₹1.26 lakh crore, has been a major recent development. These new facilities, with a projected capacity of 50,000 wafers per month, will significantly reduce India's dependence on imports for these critical components. This move towards self-sufficiency will have a ripple effect across the electronics sector.

Further bolstering domestic electronics manufacturing of the components is the upcoming scheme by MeitY, with an allocation of ₹20,000 crore, along the lines similar to the PLI. This initiative will incentivize component production, fostering the long-desired ecosystem within India. ELCOMA and its members strongly support such "Make in India" efforts, actively promoting them through our Vision 2024 and 2030 documents.

As we mark six successful years of this magazine, we express our sincere gratitude to our ever-growing readership across India and globally. The quality and informative content of our publication are a testament to your unwavering support. We are delighted by our members' continued contributions, providing valuable insights into lighting technology advancements. We encourage you all to keep sharing your fascinating articles for the benefit of the entire industry.

Wishing you a prosperous new financial year!

AMAL SENGUPTA
Secretary General
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Time to Leverage India's Potential

Dear ELCOMA Members,

I hope this message finds you in the best of health and spirits.

It brings me immense pleasure to address you and share some positive developments that are shaping our industry and our nation at large.

Amidst a constantly evolving and dynamic geopolitical environment, India's economic trajectory continues to soar, with recent GDP growth figures reflecting India's resilience and potential. The concerted efforts of both the public and private sectors have contributed significantly to this growth, reaffirming India's position as a key player in the global economy.

One of the pivotal drivers of this growth has been our increasing integration into the global marketplace through various 'Free Trade Agreements' (FTAs) with countries of greater business importance and potential. These agreements have opened new avenues for trade, fostering mutually beneficial relationships with countries around the world.

Furthermore, our 'Make in India' initiative, bolstered by Production Linked Incentives (PLIs), has begun to catalyze domestic manufacturing across various sectors. One of the more recent focuses in the field of semiconductor manufacturing is a testament to our commitment to self-reliance and technological advancement.

In line with our nation's progressive stance, we are also witnessing a concerted effort to establish a regulatory framework for emerging technologies such as Artificial Intelligence (AI) and Business Intelligence (BI). This framework will not only ensure responsible and ethical use of these technologies but also foster innovation and growth in our industry.

I am pleased to acknowledge the ever-growing importance of our in-house magazine, IllumiNation, which continues to enrich our fraternity with insightful and relevant content. Your contributions to this platform are invaluable, and I encourage you to continue sharing your expertise and experiences for the benefit of our members and the corporate community at large.

As we embark on the new business quarter, I extend my best wishes to every one of you. May this period be marked by success, prosperity, and continued collaboration towards the advancement of our industry.

Thank you for your unwavering dedication and commitment to the goals of ELCOMA. Together, we will continue to illuminate the path towards a brighter future.

Warm regards,

AVINDER SINGH
President, ELCOMA

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Design and Technology Will Drive Growth in the Era of Connected Lighting

Illumination in conversation with Mr. Anuj Dhir, Senior Vice President and Business Head, Wipro Consumer Care and Lighting for Commercial and Institutional Business on how the company is charting its future.

Would you please take us through the highlights of your 30 year long journey at Wipro?

My entire career barring the first 3 months after college have been with Wipro. I joined the company in the Lighting Design team in Aurangabad in November '93 and grew from that role. It has been a steadfast journey and a very enriching experience of working with some great leaders and team members.

Wipro's work culture and ethics are very strong with full freedom to try new initiatives and ideas. This has allowed me to experiment, take risks and grow the business.

I have not only been part of the Commercial Lighting business but also played a key role in establishing the Furniture Business. After taking over the business responsibility for lighting I have managed to pivot Wipro from an office lighting company to an overall Lighting company with a robust portfolio in Outdoor, Industrial (including flameproof) segments, new solutions in the IOT space with our Internet of Lighting Portfolio for Indoor and Outdoor Spaces.

Our focus has been to drive differentiation led by Design and Technology. This has been reinforced with multiple design awards, solidifying Wipro Commercial Lighting's reputation for excellence. We have won two Red Dot Design Awards and multiple Indian Design Awards like CII Design Awards and India Design Mark Awards.

Smart and Connected Solutions for Lighting and Beyond Lighting have been introduced by us in the space of Power Over Ethernet (POE), Wireless Solutions (iSense), workspace solutions and multiple solutions for Smart Outdoor Applications. It is because of this that today we have multiple Smart and Connected installations across segments (Indoor + Outdoor) and we have thought leadership in this space.

Our journey continues with steadfast commitment to sustained, profitable growth. Since April 2022, we have broadened our business scope beyond the Lighting business. Under Commercial and Institutional Business umbrella – Lighting, Seating are two current businesses and working on to add more to the portfolio.

What is the future roadmap for Wipro in the lighting space?

As India grows and strives to be among the top three economies in the world in the coming years, at Wipro, we are looking at playing a crucial role in illuminating spaces across the nation in a more comprehensive manner. Our focus is to build and provide, reliable and technology driven lighting products and solutions for every application. Our focus is on the people and not only buildings. This means we are not only looking at energy efficient solutions (which is given) but solutions which also focus on wellness aspects for people using that space.

We are excited about what we are creating at Wipro for the future.

How do you look at LiFi as a future game changer in the field of lighting solutions?

At Wipro Lighting we spoke about LiFi in 2017. We showcased the technology to our Indian customers starting 2017 and we were early for our time.

It is a great technology which opens up the use of light waves for data transmission as a complementary option to Radio waves. Use cases globally are for areas and applications where secure data transfer is required. Some of the prominent applications are Defence, Space, Banking Operations, Oil and Gas etc. Spaces where secure data transmission is required and where WiFi as a technology is not allowed to be used LiFi will find applications. Use cases for outdoor application are also there. Last mile connectivity for telecom operators is a future application.

The World's First Mountain Top LiFi Laser 5G Internet experiment was done in Ladakh few years back. Experimenters used LiFi enabled laser beams to transmit the data to remotest location in Ladakh.

Adoption has been low for this technology due to prohibitive costs and also integration of the technology into the laptops / mobiles. There are companies working on establishing global standards on LiFi and on miniaturisation and integration of hardware into our laptops and mobiles.

So yes, in the coming years use of Lifi will only increase, we need to wait for the Tipping point.

How is Wipro looking to address the opportunity offered by Connected Lighting / Intelligent lighting space?

Smart and Connected lighting system is just like “Light on Demand”. This ensures that light is used optimally basis the demand leading to more functionality and energy savings in long term.

LED being a digital light source has opened up many possibilities in delivering multiple outcomes for playing with Light. Light on Demand, Space Utilization, Heat Maps, Energy Dashboards, Way-finding etc are some of the popular outcomes which can be delivered.

We launched our Smart and Connected Solutions for Lighting and Beyond Lighting under our “Internet of Lighting – IOL” platform in 2017. Our portfolio solutions have adapted and evolved as per the market dynamics and also the specific requirement during and after COVID times. We have emerged stronger from all of this. We offer multiple outcomes to our customers using different underlying technologies like Power over Ethernet (POE), wireless solutions (BLE or WiFi), DALI based or analog based solutions.

Over and above these we also offer workspace solutions. Similarly we offer solutions for Smart Outdoors. Today we have a very strong installation base for indoor and outdoor applications pan India. And we continue to work in this space being clear that this is the future.

It is estimated that a large number of products being sold in India are non-compliant (non-BIS certified) products. How does this impact Wipro and what kind of advocacy would you recommend going forward?

Well, this impacts Wipro exactly the same way it impacts all our esteemed peers in the Lighting Industry. What pains me the most is the fact that at the end of the day the customer loses out. The consumer has to pay for low quality products. This is also putting cost pressures on the Industry to try and give products at lower prices, which is not a healthy sign.

I strongly recommend ELCOMA along with Industry members should take up the issue with the Government aggressively and push for a stringent enforcement of the BIS guidelines in practice.

ELCOMA has always supported Government's vision and initiatives to make India as an export hub for Lighting products and capture at least 10% of Global Lighting market by 2030. What are your views on the same?

Well, India is going to shine brighter and brighter in the global market.

While the "Make in India" initiative is indeed a commendable effort by the government to boost manufacturing and attract investment, it is essential to recognize the opportunities it presents for the lighting industry. With government initiatives encouraging investment in this sector, there's a clear pathway for the industry to scale up and thrive.

One Significant opportunity lies in the sifting global dynamics, with many companies exploring India as an investment option. This presents a prime opportunity for Indian manufacturers to expand their product offerings and cater to the growing demand in the global market.

However, it is crucial for the industry to focus not only on scaling up production but also on ensuring that products meet global standards of quality. This will be key to attracting more global companies to source products from India and establish the country as a reliable manufacturing hub in the international market.

Overall, with the right approach and adherence to quality standards, the lighting industry in India is well-positioned to shine brighter in the global market and benefit from initiatives like 'Make in India'.

The pandemic is over and the lighting industry is back on the growth path. What is the kind of growth are you looking at and where do you think the lighting industry will reach in terms of CAGR in the next 5 years?

The LED lighting market in India has not only rebounded from pre-COVID levels but is poised for steady growth in the foreseeable future. Government initiatives such as Make in India and Atmanirbhar Bharat are playing a pivotal role in driving this demand by fostering domestic manufacturing and self-reliance.

Furthermore, the infrastructure push by the government, coupled with the manufacturing boom and increasing consumer aspirations, is fueling growth trajectory of the Indian lighting industry. As consumers move up the value chain and become more willing to invest in quality lighting solutions, the market is expected to witness sustained growth.

Given these factors, it wouldn't be surprising to see a healthy compound annual growth rate (CAGR) approaching 10% in the Indian lighting industry in the coming years. This growth trajectory underscores the potential and opportunities that lie ahead for the sector, driven by both government initiatives and changing consumer preferences.

Are there any plans for Wipro to start component manufacturing in the near future, especially in light of MEITY's plan to launch a PLI Scheme of electronic components?

Maintaining strong partnerships with our manufacturing partners has been fundamental to our success since our inception, and we are committed to continuing this successful model moving forward. These partnerships have allowed us to leverage the expertise and capabilities of our manufacturing partners while focusing on our core strengths and objectives.

By fostering strong relationships with our manufacturing partners, we have been able to ensure quality, reliability, and efficiency in our operations, ultimately leading to customer satisfaction and business growth. We deeply value the collaborative efforts and mutual trust that underpin these partnerships, and we remain dedicated to nurturing and strengthening them in the future.

As we move forward, we will continue to prioritize transparency, communication, and collaboration in our partnerships, working closely with our manufacturing partners to drive innovation, streamline processes, and deliver value to our customers. Together, we are confident in our ability to achieve shared goals and sustain long-term success in the marketplace.

Given the GDP forecast by RBI, World Bank, how do you see growth path of lighting industry in the professional segment?

The recent boost in GDP projections for India by Moody's is a positive indicator for our business, as it reflects the overall growth momentum in the economy. Our business is directly benefiting from this growth, particularly in segments such as infrastructure, facade lighting, sports lighting, and manufacturing/industry.

Customers are increasingly demanding better lighting solutions for their facilities, and they are willing to invest more as long as they perceive better value in our offerings. This aligns perfectly with our commitment to delivering high-quality and innovative lighting solutions tailored to meet the evolving needs of our customers.

Looking ahead, the outlook for the professional lighting industry remains promising, with sustained growth expected over the next decade. As India continues to make strides in economic development and infrastructure enhancement, the demand for professional lighting solutions is likely to further accelerate.

In summary, the favorable economic outlook, coupled with the increasing demand for quality lighting solutions, positions us well for continued success in the lighting industry. We are optimistic about the opportunities that lie ahead and remain committed to driving growth and delivering value to our customers in the years to come.

As per reports of Research agencies, the consumer electronics industry grew between 7-9% in 2023 and is expected to grow by 10% in the next fiscal. How much do you see the lighting as a part of Smart home contribute in this space?

As Aspirational India continues to evolve, the demand for Smart Home Lighting is expected to soar. With Indians embracing technology and displaying a willingness to invest in modernizing their homes, lighting plays a pivotal role in this transformation. Mood Lighting holds significant appeal, reflecting the desire to create personalized and atmospheric environments within homes.

Smart lighting offers numerous benefits including convenience, energy savings, a wide range of colour options, enhanced security, and more. Its versatility and functionality make it an essential component of modern Smart Home Applications.

So yes, I see lighting becoming integral part when it comes to Smart Home Applications.

What are the three things you would like to advise ELCOMA to do by which it will serve the industry and the consumers?

Firstly, work with the Government to push for stringent quality standards and to ensure compliance is enforced. This will help to ensure that consumers get good quality products.

Secondly, directionally work to drive Innovation and Design in the Industry.

Also, work with the Government to co-create an Innovation Fund for the Lighting Industry. Lighting Industry in India needs to create a strong base for itself. This can only happen if we are innovation driven.

Indian consumer is now willing to pay more for good quality products.

IN A LIGHTER VEIN

How do you pass your free time in weekends?
Weekend is family time.

What are your hobbies?
Reading and experimenting on culinary skills.

What is your favourite movie/s?
The Bourne Series.

What is your favourite food?
Dark Chocolate. My all time favourite

What is your favourite Holiday Destination?
Snow Clad Mountains – Himalayas.

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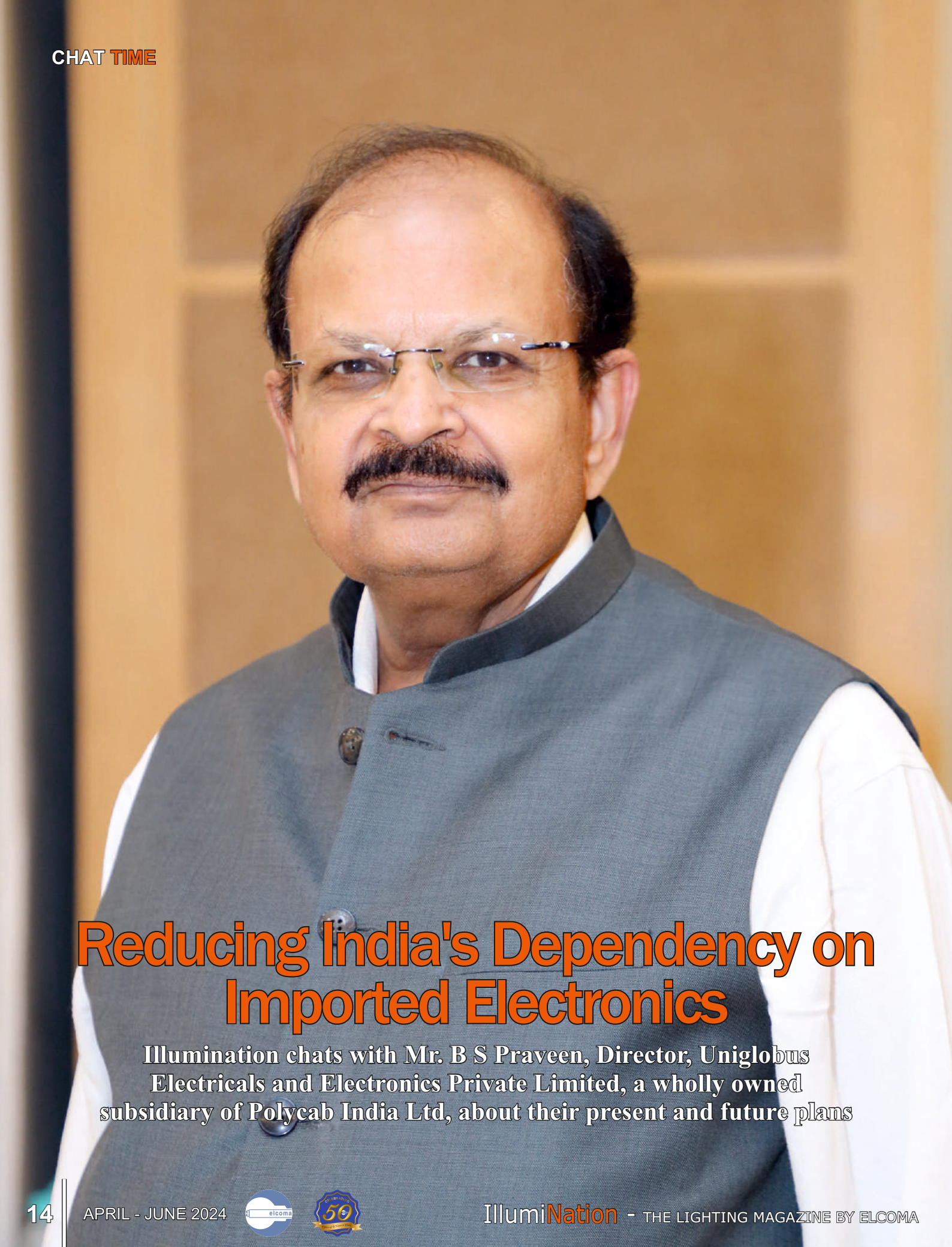

Reducing India's Dependency on Imported Electronics

Illumination chats with Mr. B S Praveen, Director, Uniglobus Electricals and Electronics Private Limited, a wholly owned subsidiary of Polycab India Ltd, about their present and future plans

Please tell us about your journey at Uniglobus since 2021 when it started.

I joined Polycab in Feb 2021 and the company Uniglobus was formed in March 2021, mainly to be a competence centre in electronics design and manufacture. Two of my colleagues from an earlier organization joined me and we started Uniglobus from scratch. We first recruited the team for R&D and Purchasing and then setup the electronics lab and electronic and luminaire production lines. By March 2022, our production line was commissioned and was ready for production and we had developed about 15 models of LED drivers. In 2022-2023 we started manufacture of luminaires and LED drivers and achieved a turnover of over 10 Cr. In FY23-24 we further developed BLDC controllers for ceiling fans and started production in Sep 2023. In FY23-24 we expect a turnover of about 16-18 Cr.

How has your experience in the fields of various industries including Heavy Engineering, Renewable energy, Automotive OEM suppliers and Electronics helped you at Uniglobus?

I am a Mechanical Engineer by qualification and till 2009 I worked in the mechanical engineering field. I moved to the Electronics Industry in 2010 and the previous experiences in mechanical engineering did very much help me in the electronics industry too. Technically the commonality between the two industries is very less and I had a steep learning curve to understand the nuances of electronic industry – but when things are approached at a conceptual level, it helps to pick up things quicker – and this is what I did.

From a managerial perspective, there aren't much differences, between industries. And when I entered the electronics industry, my job was majorly managerial – so the past experience, especially the one gained overseas definitely helped me a lot. By having exposure to both Indian and Western style of management, I was able to draw from the positives of both systems and face the managerial challenges in a better way. I was able to find a good balance between the system oriented working of the western management style and the more human touch of the Indian management style. This helped me to create and establish management processes in the Indian companies where I worked, that were process driven and less person driven, and at the same time, they catered better to the more relation based style of the Indian environment.

There definitely were challenges in doing so, like getting people to change from adhoc ways of working to more systematic way of working. But once people started seeing benefits of this style, they changed. I myself got lot of lessons in Change Management – how to first be part of the system and gradually bring in changes, rather than pushing hard for changes, etc.

I also had to enforce certain Behavioural Codes to get people to stop and start certain behaviours in their day to day working – this was one of the biggest challenges, I would say. But this helped me create an overall differentiated organizational behaviour, which helped us improve our market perception in a big way.

Which are the brands for which you are manufacturing today at Uniglobus?

We manufacture LED Drivers and BLDC controllers under the Uniglobus brand. However for luminaires, we are mostly manufacturing and selling them to our parent company, Polycab.

You are an approved PLI applicant. What are the products that you are manufacturing plant under the PLI Scheme?

We have been approved in PLI for LED Drivers, LED Modules, Wire Wound Inductors, and LED Chip Packaging. But we are currently only manufacturing LED Drivers and LED Modules. For others we have not started, due to business case reasons.

What are the challenges you are facing in the implementation of the PLI Scheme?

We face challenges in starting the LED Chip packaging project as our business case doesn't get justified. There are no significant manufacturers of LED chip packaging in India and most chips sold are from China. Due to heavy indirect subsidies by Chinese Government, we cannot compete with them unless we get Capex subsidies from the Indian Government. And also the thresholds specified in the PLI guidelines are far too high for a new entrant in the market – this poses a further challenge. We tried to check if we would be eligible for the subsidy from Central Government under the ATMP/OSAT scheme, which would make our business case viable. But as the Indian Government seems to think that LED chip is not a semiconductor chip, they haven't confirmed that we qualify. Thus we have not been able to start the project.

Is there any plan to manufacture LED chip packaging in your plant?

Not yet, due to the reasons mentioned above.

What are your plans for expansion in manufacturing and what are the expected product categories to be added in the next few years?

We are working on getting into EV charging equipment and other Power Electronic equipment. We are also developing products for the export market. We have developed products for the Armed forces. With all this we expect good growth in coming years.

What is the kind of growth by volume you are envisaging in the next 5 years?

Our vision is to expand our business

many folds, to a few hundred crores, in the next few years – focusing on power electronic equipment in general.

Given the present plans of the Government to announce another PLI Scheme on electronic component manufacturing, are you planning to participate in the scheme to manufacture other electronic components of LED lights, which will help to reduce the dependency of imported components?

We are strong proponents of Make in India, especially for those products which are currently either not made in India, or even if made in India they are not designed in India. So, we focus on 'Design and Make in India'. We have the technical strength in Power Electronics to do so, with an objective of reducing India's dependency on imported electronic products. With better understanding and support from Indian Government, albeit within their policy boundaries, we will be able to achieve this objective.

I am not sure what the next PLI scheme contains – but we will review it and take decision to move ahead with our above objective. We believe that a strong R&D in India is the way forward for a developed economy – just copy-paste technology may not take us too far. I look forward to the government encouraging more of domestic R&D too in the future, as it is doing currently for domestic manufacturing. As India is lagging far behind in R&D, at least in the commercial electronic sector, an initial government push will make a lot of difference – otherwise India doesn't lack in any of the skills – only need is to channelize this in an appropriate manner.

IN A LIGHTER VEIN

How do you unwind after a hectic week at work?
Just by spending time with family on the only day off we get in the week. Moreover, I enjoy what I do, and don't get so 'wound-up', so there is no compulsive need to unwind as such, despite the week being hectic.

What is/are your favourite holiday destination/s?
I travel a fair bit, whenever time permits, mostly by road – and there are very few parts of India that I haven't seen. So, I enjoy the journey as much as the destination. In general my travels are to religious and historical destinations. Having travelled the world too a fair bit – I would like to add here that the variety you see in India is not found overseas, in general. Especially in the developed countries, almost all places look the same.

What kind of food/cuisine do you like?
I am a vegetarian and despite my extensive travel to number of vegetarian unfriendly destinations like Korea, Japan etc. I managed to keep myself strictly vegetarian. But in that process, and perhaps due to this, I could never develop any particular liking for any non-Indian food. Whenever Indian food is available, I rarely touch other foods.

Which is/are your favourite restaurant/s?
Nothing in particular – I am not a foodie by nature.

What is the motivation, which drives you to achieve success in personal and professional life?
Very difficult question. Just achieving what I set out to achieve in itself is motivating. But I do get motivated to learn new things, whether they relate to my field or not – so any situation that leads to new learning gives me an extra motivation.

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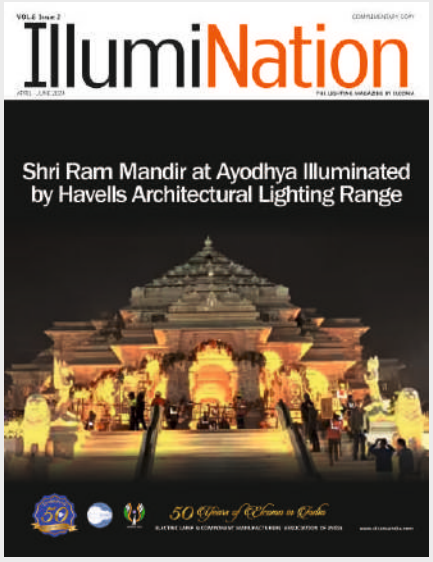

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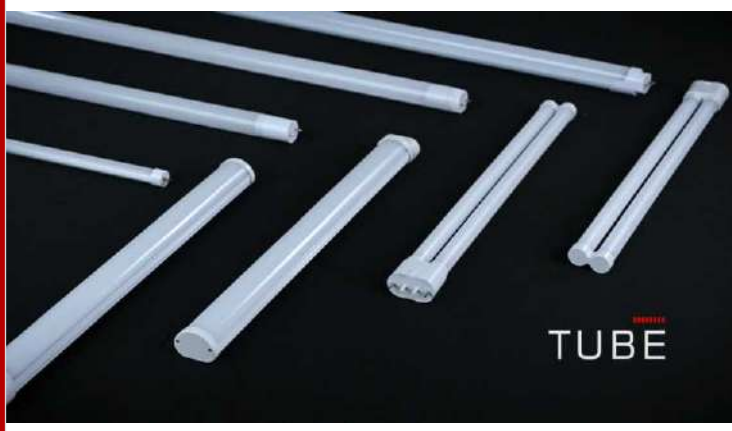
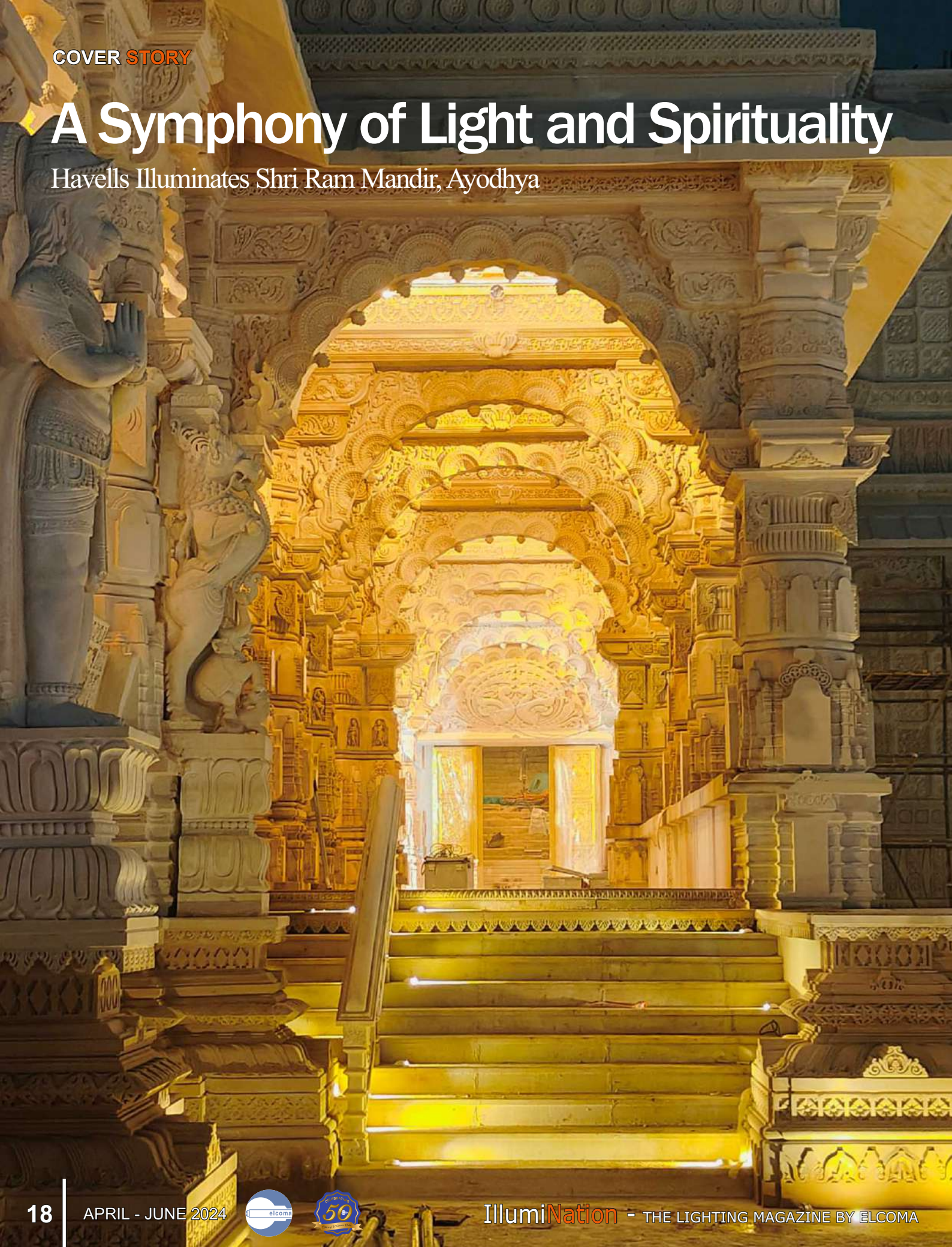


A Symphony of Light and Spirituality

Havells Illuminates Shri Ram Mandir, Ayodhya



In a historic milestone, Havells proudly announced the successful completion of their lighting project at Shri Ram Mandir in the heart of Ayodhya's Shri Ram Janmabhoomi Complex. This landmark endeavour reflects not just a technical achievement in cutting-edge lighting solutions but a spiritual commitment to enhancing the divine ambiance of this sacred temple.

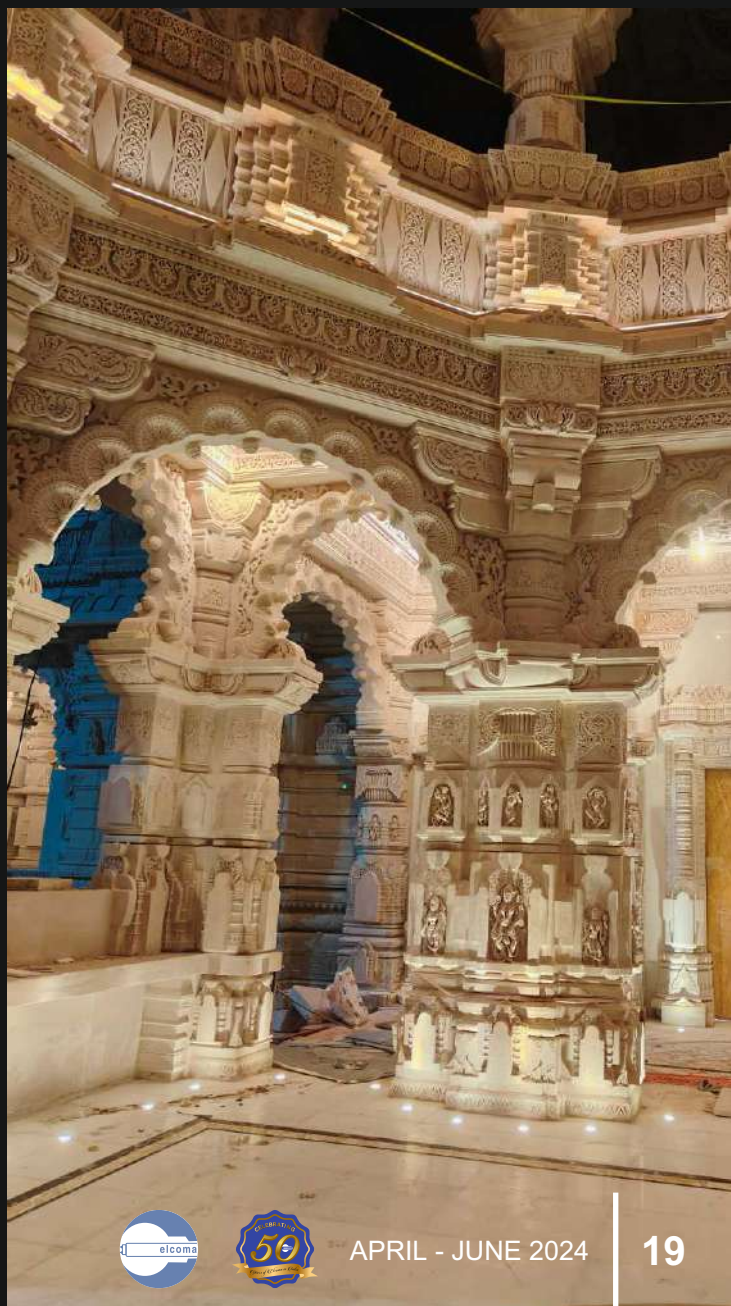
Havells, renowned for its unwavering dedication to quality and innovation, took on the meticulous responsibility of supplying, installing, testing and commissioning lighting elements that not only illuminate but also enrich the visual and spiritual experience for devotees and visitors alike.

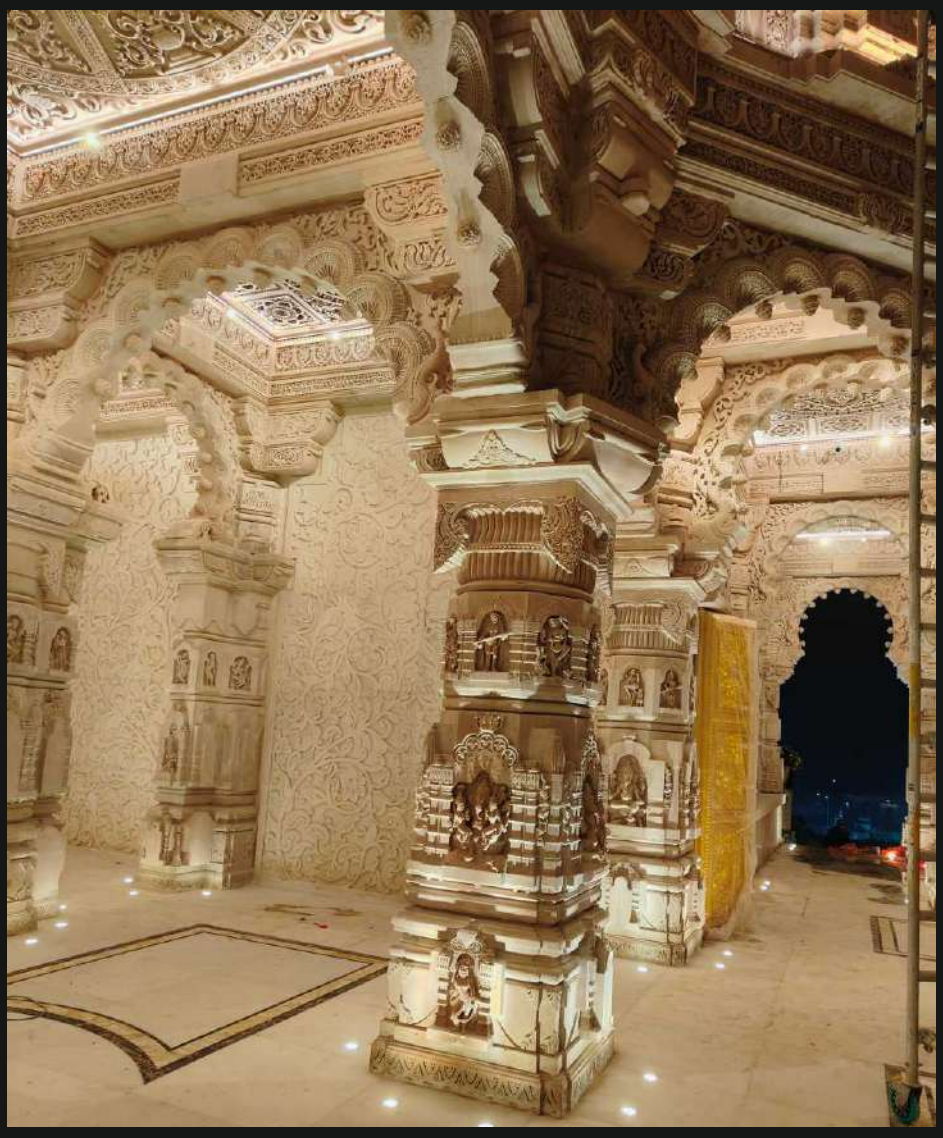
Mr. Parag Bhatnagar, President of Havells India, expressed deep honor and privilege in being entrusted with the responsibility of illuminating Shri Ram Mandir. His words resonated with pride as he acknowledged the role of Havells in contributing to the timeless legacy of this sacred site.

The heart of the temple, the Garbh Griha, received special attention, with lighting products customized by Havells to accentuate the unique architecture. Delicately highlighting intricate marble carvings within the sacred sanctuary, these lights were meticulously designed with customized form factors, optics, materials and exclusive finishes.

The lighting design extends beyond the Garbh Griha to embrace other architectural elements such as pillars, arches, and carvings. In-ground lighting luminaires with precise beam angles and minimalistic form factors were employed, not just for their aesthetic appeal but also for their durability against wear and tear.

Tailor-made lighting solutions were developed to illuminate the beauty of





intricate carvings on ceilings and walls, seamlessly blending with the overall architectural grandeur. Marble steps leading to the temple were not left untouched, as bespoke-designed step lights combined aesthetic appeal with high efficacy, contributing to the overall harmony of the temple environment.

Havells played a pivotal role in supplying and installing lighting products for this historic Shri Ram Mandir that was inaugurated and opened on January 22, 2024. The project not only signified a technical achievement but also a cultural and spiritual contribution, aligning with Havells' dedication to pushing the boundaries of innovation and preserving cultural heritage.

In the symphony of light and spirituality, Havells has left an indelible mark on Shri Ram Mandir, Ayodhya, crafting an experience that goes beyond illumination – a divine journey for all who enter its sacred doors.

AUTHOR : HAVELLS INDIA LIMITED

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Eveready lights up Magh Mela at Prayagraj

One of the holiest Hindu festivals shines under the iridescence of LED streetlights from Eveready

Magh Mela is one of the oldest pilgrimages recorded in the annals of Indian history. It is a confluence of cultures, beliefs and customs - a holy congregation where millions of devotees converge at this sacred spot for a bath of absolution. A spectacle of such magnitude demands admiration and illumination. Eveready illuminated the hopes of millions, with their range of LED streetlights at the Magh Mela.

This year the Magh Mela witnessed a human deluge and the sprawling riverbank at Prayagraj was inundated with footfalls from 120 million visitors and pilgrims, across genders, ages and vocations for the month-long kalpwas underscored the need for highest levels if safety and security.

The solution consisted of two of the most powerful and innovative flagship outdoor lighting products in the Eveready portfolio called Performa H PC and Citylite PC. This lighting solution ensured adequate visibility for rituals conducted after sunset, besides enabling eco-friendly practices lighting a new path to a brighter, smarter tomorrow.

"That we could partner the pilgrims of Magh Mela was a matter of peerless pride and privilege on the part of Eveready. We saw an opportunity where we could provide safety and security to our nation of believers, and we took it. After all, we had a reputation to live up to. We are the torchbearers of the Indian lighting industry. We dispel darkness and bring light to millions. We will remain committed to the path of light and continue to make a difference to people's lives." Mohit Sharma (Sr. Vice President - Lighting & Accessories Business & SBU head)

AUTHOR : EVEREADY INDUSTRIES INDIA LTD

Surya's Lighting Solutions Preserve the Divinity of Sanwaliya Ji Temple

A radiant transformation, where the past meets the future, continues to redefine light as a source to illuminate the lives of others.

Surya, one of the largest manufacturers of lighting solutions, has brilliantly transformed Rajasthan's revered Sanwaliya Ji Temple, situated on the Chittorgarh–Udaipur Highway. This project, representing Surya's largest-ever investment, underscores its steadfast dedication to enriching spaces and lives through the transformative power of light.

The Sanwalia ji temples of the Dark Krishna are situated on the Chittorgarh–Udaipur Highway, at the town of Bhadsora, Mandaphiya and Chapar, about 40 kilometres from Chittorgarh in Rajasthan. The deity also known as Shri Sanwaria Seth which is very renowned in Hinduism. Located 40 km from Chittorgarh, Mandaphiya is now known as Shri Sanwaliya Dham (The residence of Lord Krishna) and is second only to Shrinath Ji Temple, Nathdwara to the followers of the Vaishnav Sect. People believe that all their desires are fulfilled by their visit to Shri Sanwaliya Seth's Darbar (Court of Shri Sanwaliya Ji).

The Sanwaliya Ji Temple, a cultural gem, now radiates with a luminous glow that seamlessly blends tradition and innovation. Beyond the stunning facade lighting, the temple comes alive with Surya's mesmerizing projection mapping, 3D lighting, and sound shows, narrating tales of devotion.

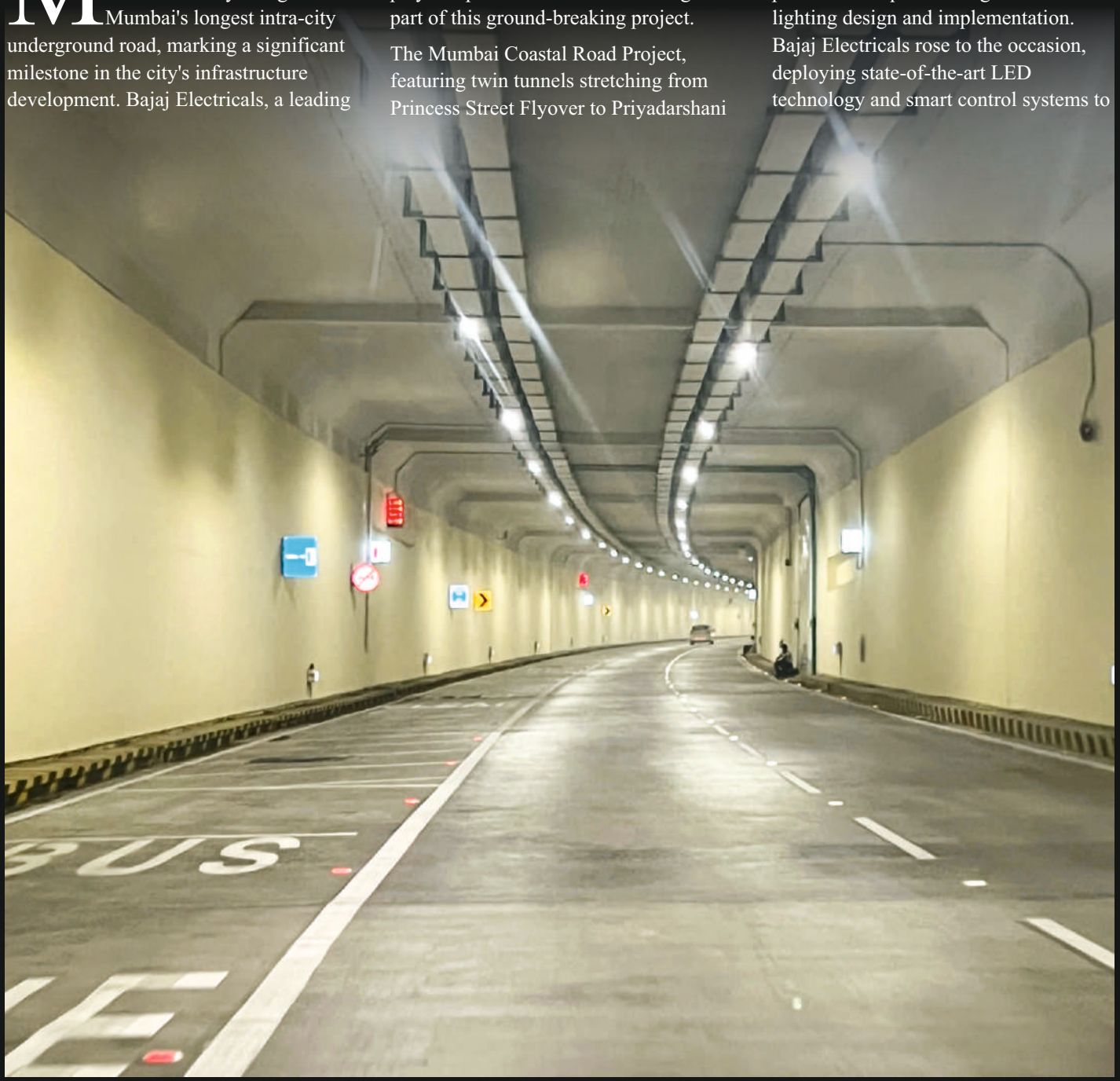
Commenting on the project launch, the CEO of Surya said that "The Surya team takes pride in not just being the lighting experts but also the architects of luminous experiences. The Sanwaliya Ji Temple project exemplifies our commitment to revitalizing sacred spaces with light."

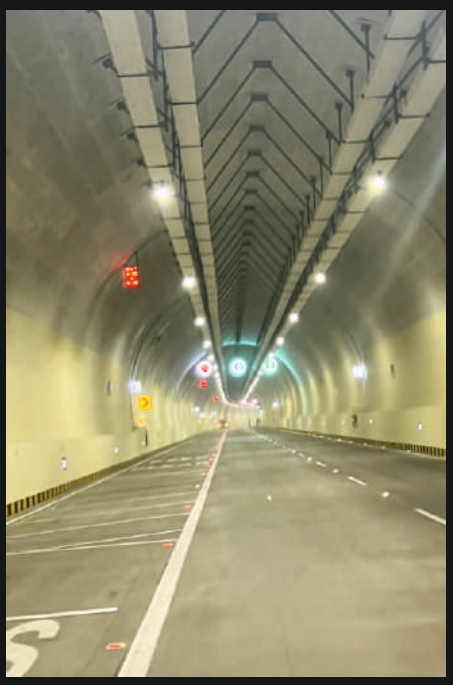
AUTHOR : SURYA ROSHNI LIMITED

Mumbai's Coastal Road's Underground Tunnel lit up by Bajaj Electricals

Maharashtra's CM Eknath Shinde recently inaugurated Mumbai's longest intra-city underground road, marking a significant milestone in the city's infrastructure development. Bajaj Electricals, a leading name in innovative lighting solutions, played a pivotal role in illuminating a part of this ground-breaking project.

The Mumbai Coastal Road Project, featuring twin tunnels stretching from Princess Street Flyover to Priyadarshani Park spanning 3.93 kilometers, presented unique challenges in tunnel lighting design and implementation. Bajaj Electricals rose to the occasion, deploying state-of-the-art LED technology and smart control systems to





ensure optimal visibility, safety, and energy efficiency throughout the tunnels.

Bajaj Electricals' solution for the Mumbai Coastal Road Project comprises best-in-class LED luminaires and a sophisticated smart lighting control system. The high-performance LED fixtures feature a specialized tunnel lighting optics design, meticulously engineered to deliver optimal illumination throughout the tunnels. These luminaires are equipped with fire retardant polycarbonate lenses, compliant with UL94, V0 Grade standards, ensuring complete safety in the event of emergencies. Complementing this advanced lighting technology is a dynamic lighting control system that seamlessly adjusts brightness levels in real-time, based on prevailing conditions such as traffic flow and weather. Moreover, Bajaj Electricals has integrated this control system with the MCGM - Command and Control Centre, providing authorities with enhanced monitoring and control capabilities for improved operational efficiency and safety.

On this occasion, Mr. Anuj Poddar, MD & CEO, Bajaj Electricals Limited commented that, “As we celebrate this momentous occasion, we recognise the significance of our role in shaping the future of urban infrastructure. Our cutting-edge lighting solutions not only illuminate the coastal road tunnel but also serve as beacons of safety and efficiency, guiding the way forward for Mumbai dwellers. This project epitomises our commitment to engineering excellence and underscores our unwavering resolve to illuminate the path towards a brighter, safer tomorrow."

Mr. Rajesh Naik, Head of Lighting Business at Bajaj Electricals said, "At Bajaj Electricals, we are honored to have played a pivotal role in illuminating Mumbai's longest intra-city tunnels. Our relentless pursuit of excellence in lighting technology has empowered us to overcome unique challenges and deliver solutions. This project stands as a testament to our unwavering commitment to excellence and our vision of a brighter future. Bajaj Electricals' pioneering lighting solutions for the Mumbai Coastal Road Project exemplify the company's dedication to pushing the boundaries of innovation. As the tunnels shine brightly with energy-efficient illumination and cutting-edge technology, Bajaj Electricals reaffirms its commitment to enhancing the urban landscape for generations to come.”

AUTHOR : BAJAJ ELECTRICALS LTD

Signify illuminates the Sela Pass Tunnel in Arunachal Pradesh

The much-awaited Sela Pass Tunnel in Arunachal Pradesh which is the world's largest bi-lane tunnel was recently inaugurated by Prime Minister Narendra Modi. In case of harsh weather conditions, this tunnel can be used for the movement of rescue vehicles and evacuation of stranded people. The tunnel has been designed for a traffic density of 3,000 cars and 2,000 trucks per day with a maximum speed of 80 km per hour. The project was necessitated as the Balipara-Chariduar-Tawang road often remains closed due to snow and landslides caused by heavy rainfall in the area.

Built at an altitude of 13000 ft, the 11 km long Sela Pass Tunnel constructed by the Border Roads Organisation (BRO), provides all-weather connectivity to Tawang across the Sela Pass on the Balipara-Chariduar-Tawang Road in Arunachal Pradesh. Its construction has shortened the commute in the region by one hour and thirty minutes. The tunnel's lighting – designed and installed by Signify - plays a significant part in the tunnel's safety.

Lighting up tunnels for optimum safety

To ensure that movement through the tunnel is swift and safe in the harsh weather conditions, lighting has been constructed such that, whether day or night, vehicles can travel through the tunnel at approximately the same speed and level of comfort as they do on the roads entering and exiting the tunnel. A lighting design that ensures safety and good visibility is a key element in the

success of any tunnel project. For the Sela Pass Tunnel Philips FlowBase G2 has been used that combines compact design, reliability, and affordability in one complete package to bring the perfect lighting solution using professional optics.

Installing such lighting required long hours of technical seminars on design and multiple design iterations to withstand harsh weather conditions. The effort was well worth it as Signify achieved optimized results based on CIE 88. The lighting inside the tunnel is fully automated with SCADA integration, negating the need for manual intervention. The tunnel's carriageway lighting meets the criteria set by CIE 88 and also meets the criterion for TI, flicker frequency, and UI.

All Weather Lighting

Philips FlowBase G2 ensures the best-in-class efficiency i.e. 140 lumens/watt delivering a high rate of safety, security, and lighting across varied weather conditions – from minus 30 degrees to 45 degrees. Because of Signify's superior tunnel optics and energy-efficient luminaire, Signify's lighting solutions' load factor is lower making it a leader across the industry. Operating the tunnel using Signify's lighting solutions will lead to lower costs over the long run.

Durability & Reliability

The Sela Pass Tunnel is a game-changer not only because of its solid build and strength but also because of its lighting, which makes passage through the tunnel safe, smooth, and enjoyable. Backed by a superior thermal design, Philips FlowBase G2 comes with an IP66 and IK08 rating, made from high-grade die-cast aluminum to ensure luminaire durability and superior heat dissipation.

AUTHOR : SIGNIFY INNOVATIONS INDIA LIMITED

The images are sourced online

Enhancing Hospitality with Automation

A Look at Guest Room Management Systems

The hospitality industry is poised for significant growth in India, fueled by increasing tourism and a focus on establishing a strong presence in the global tourism market. Automation, particularly through lighting management systems, plays a crucial role in improving customer experience, managing energy consumption, reducing carbon footprints, and promoting environmentally friendly practices.

Broadly the automation application in the hotels can be segregated in two parts (a) Guest Room Management System (GRMS) and (b) FOH (Front of House) and Public Area

Typically, a GRMS can be defined as a consolidated automation system which is able to take care of not only the lighting requirement but also the other guest room related parameters like curtains, air conditioning, room temperature and others. Most importantly such a system should have the feasibility of scaling up. It must be equipped to collect the required data of user(s) and their choices which can be used to enhance their future experience. At its simplest form it can be room specific and can go up-to completely centralized. GRMS Systems should be equipped to take automatic corrective actions in case of any mistake or errors by user.

A typical GRMS system should be able to provide

- **Enhanced Guest Experience –** Main objective of any Hospitality Establishment is to give the best experience to the Customer. By implementing a data driven centralized GRMS they can curate the best stay experience of any customer based on their preferences as well as behavioural attributes. Not only that, they can even prepare customer specific loyalty program for individuals based on their preferences.
- **Energy Management –** In this era of stiff energy scarcity, a centralised

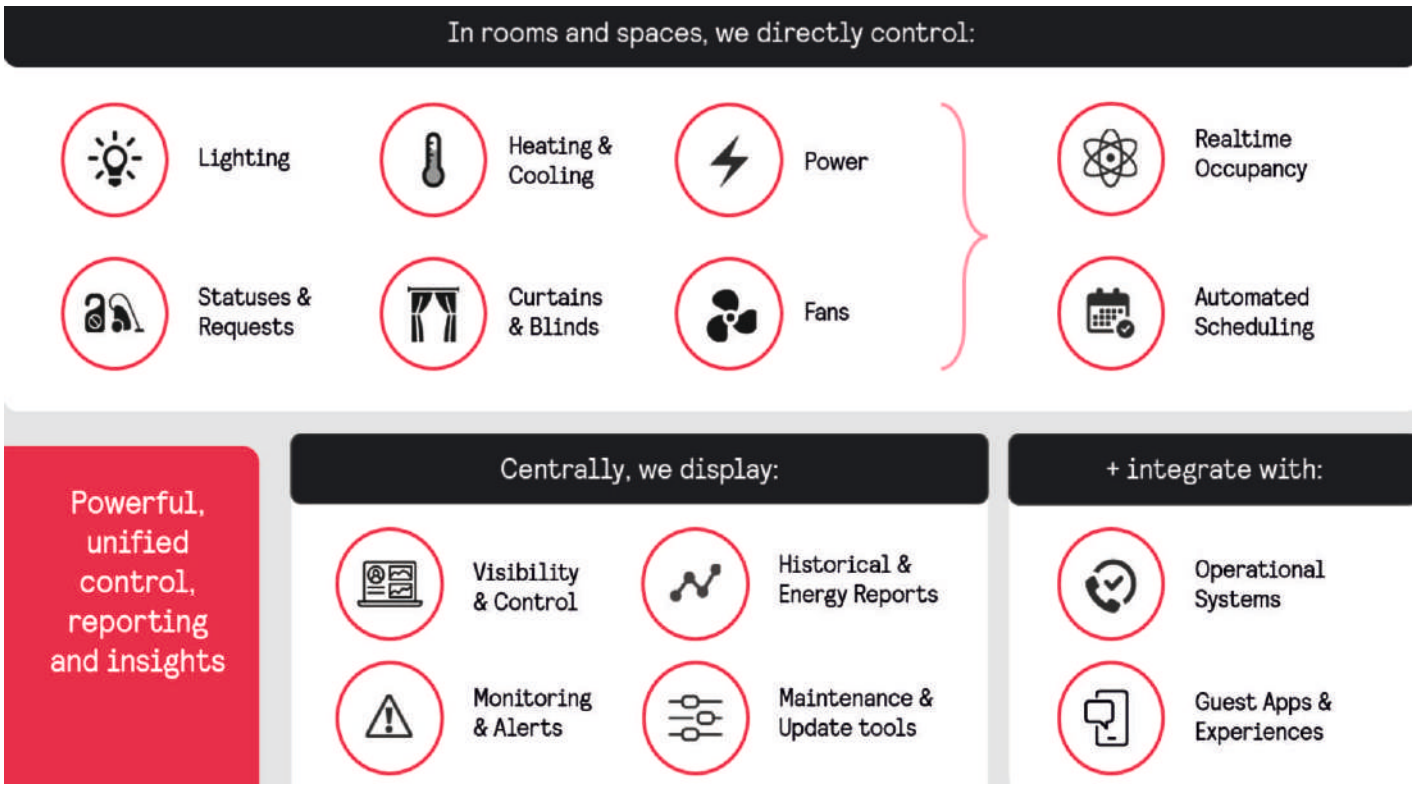


Fig : Matrix of a perfect guest room experience

system can help the property to achieve the optimal usage of energy which will not only contribute to the environment but also substantially reduce the huge financial burden for energy usage.

- **Operational & Staff Efficiency** – As the centralized system provides a central dashboard with all the occupancy details and status which will surely enable the concerned facility department(s) to deploy the staff and increase their work efficiencies.

Most importantly, all the above features must come without compromising any of the below crucial parameters such as

- **Security & Encryption** – In the era of Data / digitization, encrypted and secure data usage enhances the trust of every customer and they will be least bothered about their digital footprints.
- **Deep integration with hotel operations** – the GRMS system should not work separately, rather it should be an integral and essential part of the hotel operation.
- **Complete Property Control** – By enabling energy saving, monitoring, automation, integration, or data digging and analyzing, GRMS provides the complete property control to the concerned authority.
- **Intuitive for the whole team** – a simple form of data representation (tabular/ pictorial. Graphical) enables the concerned team(s) to analyse all the critical parameters related to energy usage, space utilization pattern and as well as the guest experience and preference.

While implementing this GRMS, guest experience can be elevated to a different level with the help of some key features.

	**Real Time Occupancy** – This is one of the key differentiators of GRMS over normal Automation system, It includes every aspect of guest experience from check-in to check-out (Fig 1.1)
	**Lighting Control** – which can enable to have lighting based on circadian cycle, typical task lighting, anti-fall lighting for guests (Fig 1.2)
	**Heating & Cooling** - which includes automated conditioning, Balcony Linking, One Touch Mode like Green Mode or VIP Mode.
	**Room Status** – enabling guests to send the instruction to various function from room itself through GRMS system like Do Not Disturb/ Privacy, Make up/ cleaning Room or various service calls like Laundry/ Buttler/ Room Service etc.
	**Drapery / Curtain** – which will control motorised curtains and creating various preset scenes like "Welcome Guest Scene" based on the time of checking in, which will definitely increase the personalized experience of guest.
	**Power** - At the same time after checking out it can deactivate all the power outlets to ensure optimal energy saving.
	**Fans** – It includes all fans like ceiling fan, extractor fans, mirror defoggers, underfloor heating and so on to provide a complete experience at the same time it can be automated to flag "OFF" status to all the fans after guest check out to ensure optimal energy saving.

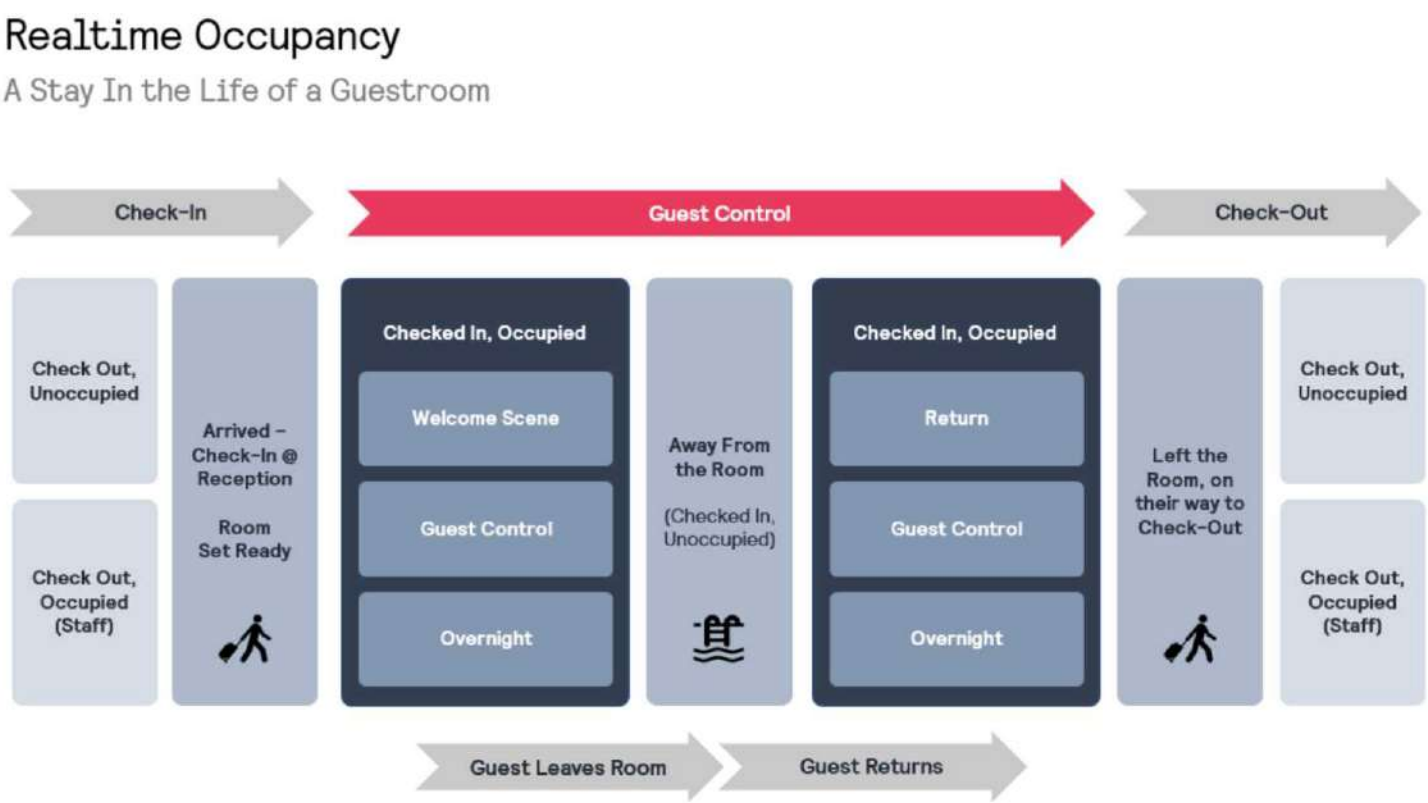


Fig 1.1

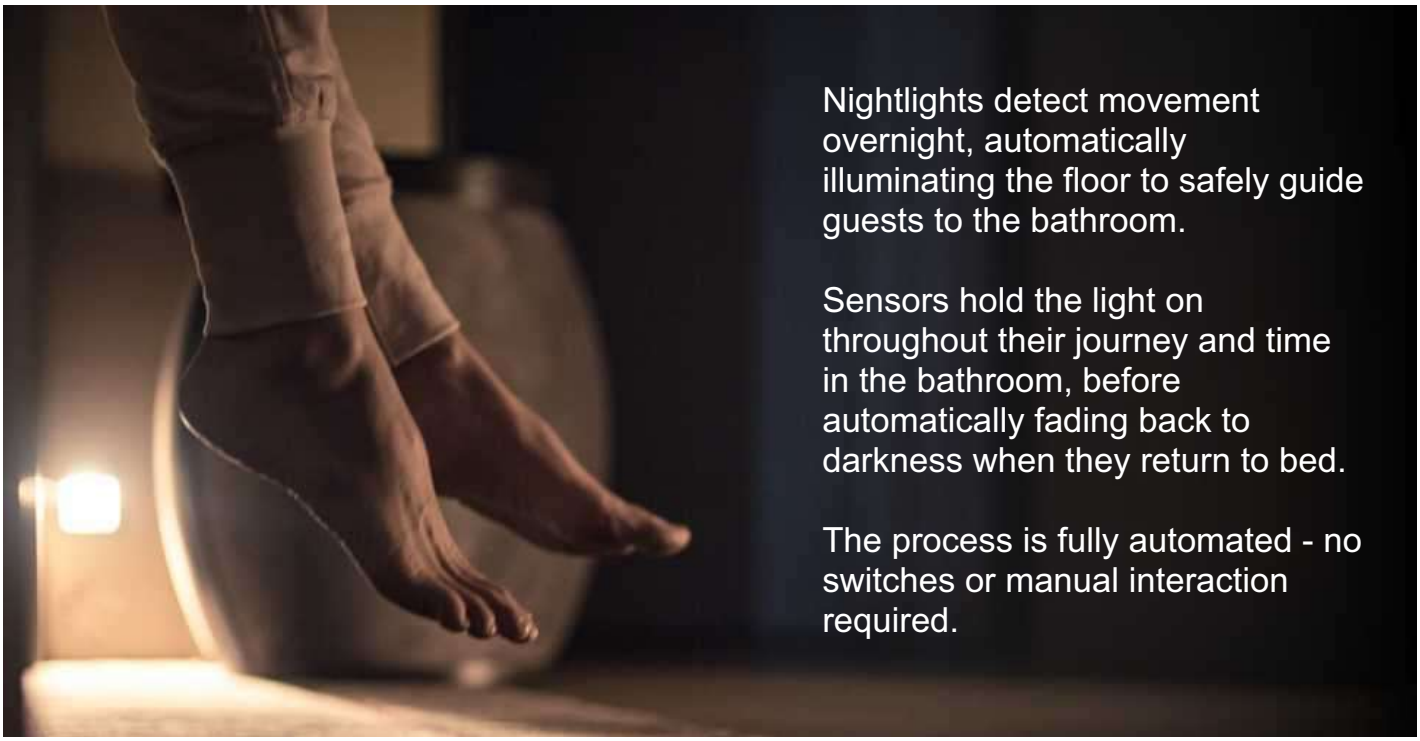


Fig 1.2

AUTHOR : SUSNATA BHOWMICK – VERTICAL HEAD- SYSTEM INTEGRATION BUSINESS – SIGNIFY INNOVATIONS INDIA LTD

IN MEMORIAM

SHRI BASUDEV AGARWAL

A True Visionary

3rd June, 1929 - 4th March, 2024

In the grand tapestry of time, Shri Basudev Agarwal ji emerges as a visionary luminary, crafting the narrative of Surya's ascent to prominence within the Steel and Lighting industry. His seminal contributions began early as a co-founder of Jindal group and subsequently founding Surya Roshni with establishment of its Steel Pipe plant at Bahadurgarh (Haryana) in 1973 and Lighting plants in Kashipur (Uttrakand) in 1984 and Malanpur, Gwalior (M.P.) in 1991. Under his stewardship, Surya accomplished leadership in both Steel Pipes and lighting businesses with revenue of ~8000cr in FY23 and presence in more than 70 countries globally.

At the helm of Kashipur plant, Shri Basudev Agarwal ji laid the groundwork for Surya's expansion with two G.L.S and two F.T.L. assembly chains. These humble beginnings belied the magnitude of his vision, which encompassed not only manufacturing prowess but also comprehensive integration of Glass furnaces, Tungsten filaments, Aluminum caps plants, and other critical components. Through his strategic acumen and unwavering commitment to quality, Shri Basudev Agarwal ji propelled Surya to unparalleled heights, setting benchmarks that reverberated throughout the industry.

Central to Shri Basudev Agarwal ji's ethos was the unwavering pursuit of excellence without borders. His relentless quest for cutting-edge technology took him across continents, where he forged partnerships and acquired state-of-the-art equipment to ensure that Surya's products stood at the pinnacle of global standards. Yet, amidst his global engagements, he remained firmly rooted in the day-to-day operations of the plants, personally overseeing every aspect with meticulous care and attention.

Shri Basudev Agarwal ji's impact transcended not only the confines of corporate corridors, his leadership was imbued with a deep sense of compassion and empathy, as evident by his unwavering commitment to welfare of Surya's employees. Initiatives spearheaded by him not only enhanced workplace conditions but also fostered a culture of camaraderie and mutual respect.

His philanthropic endeavors extended far beyond the confines of the corporate world. As Founder Trustee of the Basudev Gangadevi Agarwal Seva Trust, he extended a helping hand to the underprivileged, providing vital support for medical and educational needs. His altruistic spirit also manifested in his role as the former Chairman of Hissar Improvement Trust, where he spearheaded transformative initiatives for local development.

In addition, Shri Basudev Agarwal ji's commitment to healthcare and education was unwavering. His patronage of Maharaja Agresen Hospital, Delhi, and involvement as a Trustee in the N. C. Jindal Charitable Trust, Hissar Haryana, underscored his dedication to societal well-being. Similarly, his roles as Trustee in Maharaja Agrasen Technical Education Society, Delhi, and Trustee in Haryana Charitable Society Trust, Kolkata, reflected his belief in the transformative power of education as a catalyst for progress.

Shri Basudev Agarwal ji's heart resonated with causes dear to his soul, as exemplified by his role as Chief Patron in Shri Krisnna Gaushala, Bawana Delhi, where he championed the welfare of animals. His unwavering devotion, embodied in his status as a Life Member of ISKCON and Haryana Sewa Sadan, Kolkata, transcended boundaries, embodying a spirit of service and compassion that touched lives far and wide.

In the fabric of our collective memory, Shri Basudev Agarwal ji's legacy remains unparalleled, a testament to his transformative leadership with empathy, integrity, and an unwavering commitment to excellence. His life's work will serve as a guiding light, inspiring generations to strive for excellence in all endeavours.

Shifting paradigm from "Visual Brightness" to "Visual Comfort"

Lighting Quality parameters and their Impact of Indoor Environmental Quality (IEQ)

Indoor Environmental Quality (IEQ) is an oft discussed topic, gaining significant importance while designing built environments in post COVID era. This refers to the quality of the environment inside buildings and structures, encompassing various factors that can affect occupants' health, comfort and productivity.

Complying to IEQ related parameters is a necessary design parameter and included as compliance requirement in the existing and forthcoming revisions in IS, ISHRAE, Green Building Codes, EC(S)BC and WELL regulations. Lighting is a key criteria in achieving the desired conditions of IEQ. In this article we attempt to emphasise the relevant Lighting quality parameters connected to IEQ. It is the need of the hour for users, specifiers and manufacturers to focus adequately on quality parameters and not only efficiency parameters of lumen/watt.

Indoor Environmental Quality (IEQ)

Research has shown that poor IEQ can have short and long term health effects. Studies have shown that improved IEQ can lead to higher levels of productivity and cognitive performance among building occupants. Proper lighting, ventilation, thermal conditions and noise control are essential for creating environments conducive to focused work, learning, and creativity. Inadequate control of these factors can lead to discomfort, distraction, and decreased productivity.

In a good indoor environment, work efficiency of occupants gets enhanced, learning results are better among students and absenteeism is lower. This in-turn increases workplace productivity and test scores in schools, which is supported by research.

- **Health Impact -** Various studies have decisively concluded that poor IEQ can lead to various health issues, including respiratory problems, allergies, headaches, fatigue and even more severe conditions like asthma and sick building syndrome. It could increase the stress level in human body, thus creating health issues like sleep disorders, digestive problems and memory and concentration impairment besides resulting into discomfort of occupant
- **Energy Efficiency -** IEQ and energy efficiency are closely linked. Energy-efficient buildings often incorporate features such as high-performance insulation, efficient HVAC systems and daylighting strategies, which can positively impact IEQ by providing better thermal comfort, indoor air quality and lighting conditions.
- **Sustainability -** Enhancing IEQ aligns with sustainability goals by promoting the use of energy-efficient technologies, reducing resource consumption and minimizing environmental impacts.

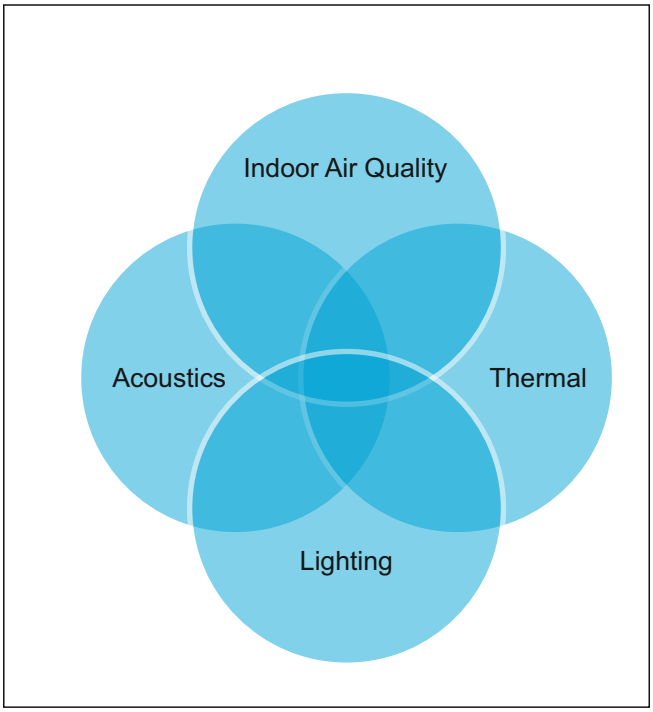
Air quality, thermal, lighting and acoustics are identified as four critical elements of IEQ in most standards and threshold limits are set. This article intends to address lighting parameters impacting IEQ beyond the obvious which are included in standards.

a **Indoor Air Quality (IAQ) -** Presence of pollutants such as VOCs, particulate matter, carbon monoxide, and radon, as well as ventilation rates and filtration efficiency impact air quality. IAQ plays a significant role in determining occupants' health and is a trigger for many health issues.

b **Thermal Comfort -** Factors like temperature, humidity, air movement, and clothing insulation influence occupants' perception of comfort.

c **Lighting Comfort -** Quality and quantity of light, for both visual and non -visual response including natural daylighting, artificial lighting, glare, colour quality, flickering. These influence occupant well-being as it impacts circadian rhythms and lead to sleeping disorders and related ailments, if the parameters are off limits.

d **Acoustics Comfort -** Noise levels, sound quality and speech intelligibility within indoor spaces



influence concentration, communication, well-being and productivity

The above four critical parameters are included and defined in various codes and standards as design, measurable parameters, test requirement and test method. Besides these, it is also important to address

- **Ergonomics -** Design of furniture, equipment, and workspace configurations to support occupants' physical comfort and well-being.
- **Psychological Factors -** Elements such as aesthetics, access to views, biophilia, and perceived control over the environment can also impact occupants' satisfaction and stress levels

While respective standards under reference elaborates on individual components and parameters, following are generic guidelines to improve IEQ

- **Ensure Adequate Ventilation -** Proper ventilation is essential for maintaining good indoor air quality by diluting and removing pollutants. Ensure that HVAC systems are properly sized, maintained, and operated to provide adequate ventilation rates. Consider using energy recovery ventilation systems to improve indoor air quality while minimizing energy consumption.
- **Control Indoor Air Pollutants -** Minimize indoor air pollutants by using low-emission materials and products, such as paints, adhesives, and furnishings. Implement source control measures, such as smoking bans and proper storage of chemicals, to reduce pollutant sources. Install air filtration systems to remove particulate matter, allergens and other contaminants from indoor air.
- **Maintain Thermal Comfort -** Optimize indoor temperature and humidity levels to ensure occupants' comfort and well-being. Use programmable thermostats and zoning systems to provide individual control over thermal conditions in different areas of the building. Implement passive design strategies, such as shading devices and natural ventilation, to minimize reliance on mechanical heating and cooling systems.
- **Manage Acoustic Conditions -** Control noise levels and improve sound quality within indoor spaces by using sound-absorbing materials, acoustical treatments, and noise barriers. Design spaces with appropriate room layouts, partitions, and spatial configurations to minimize sound transmission and enhance speech intelligibility
- **Promote Ergonomic Design -** Select ergonomic furniture, equipment, and workspace layouts to support occupants' comfort, posture and productivity. Provide adjustable furniture and equipment to accommodate individual preferences and needs. Encourage regular breaks and movement throughout the workday to reduce the risk of musculoskeletal disorders.
- **Provide proper lighting conditions -** Maintain light quantity and quality parameters as per prevailing national standards. Other required/mandatory parameters influencing visual comfort are elaborated in the later sections.

It is important that building owners/ facility managers implement policies and procedures to monitor and manage IEQ on an ongoing basis. They should educate occupants about IEQ principles and best practices to foster a culture of environmental awareness and responsibility. They should conduct regular inspections, testing, and maintenance of building systems and components to ensure optimal performance.

Lighting parameters influencing and impacting IEQ

Providing Visual comfort is one of the key pillars that impacts IEQ. It is important to note that both Visual and Non Visual Impact of Lighting are influencers and fall within the ambit of Visual Quality in IEQ.

1. Luminous environment

Adequate levels of illumination are necessary to support visual tasks and provide comfortable visual working conditions. Insufficient light can cause eyestrain, while excessive light can lead to glare and discomfort. Key lighting parameters which ensures a comfortable visual balance

- **Lighting Level & Uniformity -** It is important to meet the visual quantity parameters (illuminance and uniformity) at the required working plane for Task / Surrounding and Background area. This improves adaptability and reduces eye strain. Based on the activity, lighting level can be calculated and measured at horizontal/vertical/inclined or semi cylindrical plane. All parameters (i.e. E_{task}, $E_{surround}$, $E_{background}$) and overall uniformity $Uo = E_{min}/E_{avg}$, must be met as per the prevailing national standards. These parameters are calculated and measured on grids as defined in standards.
- **Spatial Distribution/ Brightness Balance -** In addition to Task Illuminance and uniformity, the brightness balance of wall, ceiling and floor ($E_{ceiling}$, E_{wall}) has to be maintained. National standards define this requirement either as a percentage of Task Illuminance or in absolute values. The reflectance of walls, ceilings, floors, (R_c , R_w, R_f) and other surfaces in the space affects how much light is reflected and where it is directed. Highly reflective surfaces can increase reflected glare. The texture of surfaces can affect how light is diffused and scattered. Rough or textured surfaces may scatter light more evenly, reducing the intensity of reflected glare compared to smooth or glossy surfaces.
- **Equivalent Melanopic Lux (E_m) -** is a measure of light intensity weighted according to its effect on the melanopsin receptors in the human eye. The significance of

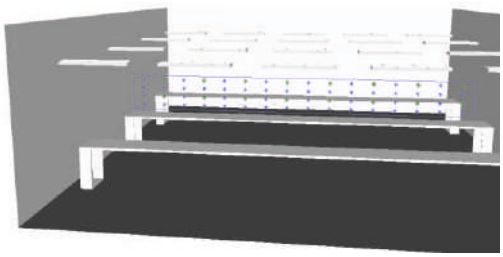
E_m lies in its ability to quantify the biological effects of light beyond just vision. By considering the spectral sensitivity of melanopsin, E_m provides a more accurate representation of the impact of light on human health and well-being, particularly in terms of circadian rhythm regulation. E_m is important in environments where the timing and quality of light exposure can influence human physiology and behavior. E_m can help optimize lighting design to promote alertness and productivity during the day while supporting restful sleep at night for shift workers or those with irregular schedules.

- Equivalent Melanopic Lux = Visual Lux (at vertical plane 1.2 m above floor level)* Melanopic Ratio. A value of 250lux is recommended with daylight or 150lux with artificial lighting alone
- Melanopic ratio R is the ratio of melanopic irradiance (E_{me},) and photopic irradiance

EML = visual lux x melanopic ratio

CCT (K)	Light Source	Melanopic Ratio
2950	Fluorescent	0.43
2700	LED	0.45
2800	Incandescent	0.54
4000	Fluorescent	0.58
4000	LED	0.76
5450	CIE E (Equal Energy)	1.00
6500	Fluorescent	1.02
6500	Daylight	1.10
7500	Fluorescent	1.11

Source: WELL Building Standard® reference Tables L1 and L2 (p190-192)



Note : *Melanopsin is a photopigment in the retina responsible for regulating the circadian rhythm and influencing non-visual responses to light, such as alertness and sleep-wake cycles.*

2. Colour Quality

- **Colour Temperature -** The colour temperature of light, affects the visual appearance of a space and can influence mood, perception and well-being. Warm colour temperatures (lower Kelvin temperatures) create a relaxing atmosphere, while cooler colour temperatures (higher Kelvin temperatures) are often preferred for task-oriented environments. Selecting the appropriate Colour temperature for the task/activity and also time of day is important for occupant comfort.
- **Colour Rendering Index (CRI) -** CRI measures the ability of a light source to accurately render colours compared to natural light. Higher CRI values indicate better colour rendition, which enhances visual comfort. Along with absolute values of CRI, it is important to evaluate the spectral composition and ensure that there is balance between all colours especially presence of Red spectrum, (R9) which is important criteria for enhanced Visual Comfort

3. Daylight Integration

Incorporating natural daylight into indoor lighting design improves visual comfort and well-being and reduces energy consumption. However, it's essential to control glare and mitigate excessive heat gain or glare associated with daylighting strategies. It is recommended to seamlessly merge natural daylight with artificial illumination that can adapt to the changing needs of occupants

4. Glare Control

Glare causes visual discomfort, including eyestrain, headaches, and fatigue. It can make it difficult to see clearly, especially when trying to focus on tasks or objects. This can increase the risk of accidents and errors, particularly in tasks that require precision or concentration. Exposure to excessive or poorly controlled light, including glare, can disrupt circadian rhythms and interfere with sleep patterns. This can lead to sleep disturbances, fatigue, and other health issues. Prolonged exposure to glare can lead to increased sensitivity to light (photophobia), making it even more uncomfortable and challenging to tolerate bright light sources Chronic exposure to glare has been associated with various health issues, including eye strain, dry eyes, and exacerbation of existing eye conditions such as cataracts and age-related macular degeneration. To ensure glare control, one must ensure luminaire design parameters to meet glare limitation requirement parameters, namely a) Shielding Angle, b) Surface brightness of luminous surface at normal viewing angles, and c) Unified Glare Rating

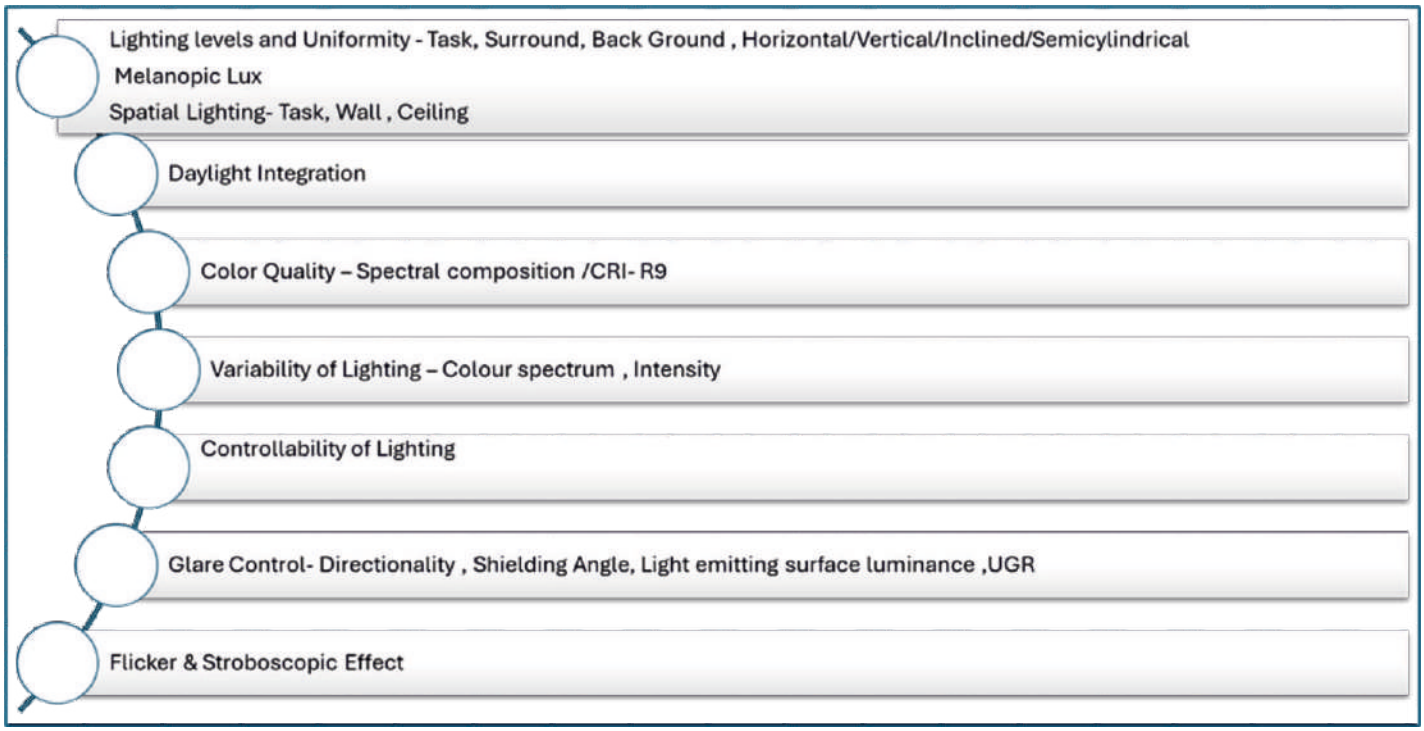
The positioning and type of luminaires used in the space play a significant role in determining the direction and intensity of light. Improperly positioned or overly bright luminaires can cause excessive reflected glare. The layout and geometry of the room influence how light is distributed and reflected. Irregular room shapes or large open spaces can result in more complex patterns of reflected glare. The location of occupants within the space relative to light sources and reflective surfaces can affect their exposure to reflected glare. Proper seating arrangements and workstation layouts can help minimize glare for occupants.

5. Flicker and Stroboscopic Effect

Minimizing flicker and stroboscopic effects in lighting systems is crucial for visual comfort and health. Rapid fluctuations in light intensity can cause eyestrain, headaches, and other discomforts, particularly in environments where visual tasks are performed for extended periods.

Flicker in LED lights can be caused by a few factors:

- **Power Supply Fluctuations:** Variations in the electrical current supplied to the LED can result in flickering.
- **LED Driver Issues:** Poorly designed or malfunctioning LED drivers can cause inconsistent power delivery to the LEDs, leading to flicker.



- **Pulse Width Modulation (PWM):** Some LED lights use PWM to control brightness by rapidly turning the LEDs on and off. If the frequency of this modulation is low, it can cause visible flicker.
- **Quality of Components:** Low-quality LEDs or components in the lighting fixture can contribute to flickering issues.

Environmental Factors: Temperature fluctuations, humidity, or aging components can also affect the stability of LED lights and lead to flickering.

The flicker index in LED lights refers to the measure of rapid fluctuations in brightness, typically caused by variations in the electrical current powering the LED. Lower flicker indexes indicate more stable light output, which can be beneficial for reducing eye strain and avoiding potential health issues associated with flickering lights.

The stroboscopic effect in LED lighting is primarily caused by the rapid on-off cycling of the LED. When an LED light source operates with a low refresh rate or flicker frequency, it can create brief periods of darkness between the cycles of light. If this cycling coincides with the movement of an object, especially fast-moving objects, it can create the illusion of reduced motion or even stillness. This effect is more noticeable in environments with low ambient lighting or when using LED lights with low-quality drivers or poor dimming controls. There are several standards which address the flicker Index stroboscopic effect in LED lights

6. Variability of Lighting

For optimal visual comfort, lighting fixtures which can be varied across the daylight spectrum and intensity to mimic natural daylight, is considered a preferred solution to adjust circadian rhythm and enhance occupant well-being. The prevailing standards include this feature as a requirement to meet higher category rating.

7. Controllability of Lighting

Visual comfort is enhanced through flexible and personalised control system, offering users to switch ON and OFF, set preferred light intensity, colour and scenes.

8. Energy-efficiency

While meeting all the above parameters, it is imperative that the lighting systems contribute to indoor environmental quality by reducing energy consumption, minimizing heat generation, and lowering greenhouse gas emissions. This improves environmental sustainability and occupant comfort while reducing operating costs.

Summary

It is important to note that the current codes and recommendations on IEQ may or may not include all the lighting quality parameters as listed above. However, all these criteria have direct impact on visual comfort, thereby enhancing wellbeing and productivity. By implementing these strategies and prioritizing such specifications in lighting products, stakeholders can create healthier, more comfortable and more productive indoor environments for occupants while also supporting sustainability and energy efficiency goals. This will positively affect the lighting industry, expanding local and export market size.

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Dual-Purpose Device for Lighting and Indoor Air Quality

The article details a UV disinfection system that has been incorporated into a 2 x 2 feet LED luminaire

COVID-19 has made some permanent changes in our lives by way of adding new requirements to the environment in which we live and made us look at the problem of air borne infection far more seriously than ever before. However, the awareness of preventing air borne microbial infection in any healthcare facility has been there for well over a century and in air-conditioned spaces the problem of airborne infection is much more serious as it could affect all occupants of the building. Since March 2003 UVC irradiation of cooling coils has now been incorporated in the Facilities Standards for Public Building Services by US General Services Administration office of the Chief Architect. This standard is meant to address the problem of Indoor Air Quality (IAQ), particularly to overcome 'Sick Building Syndrome'. In June 2023 American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE) has strongly recommended incorporating air disinfection system in air-conditioned spaces, in line with the recommendation of the US government made in the year 2003.

Of all the technologies available for air disinfection, Ultra Violet Germicidal Irradiation (UVGI) does not involve the use of any chemical, deactivates every possible microbe, is cost effective and is easy to implement. In India the UVGI technology for air disinfection was launched over a decade ago and since then it has become a widely accepted technology. It has been installed in all underground metro stations, many airports, offices, hospitals, malls, etc. The most common version of UVGI for air disinfection is to shine UVC light on cooling coils located in the Air Handling Units (AHUs) of HVAC systems. Besides air disinfection, UVGI in AHUs leads to many other advantages including up to 15% reduction in HVAC energy consumption, reduced maintenance, etc. Another version of UVGI for air disinfection is to install UV lamps in a HVAC duct itself - such an arrangement is almost a must for an operating theatre. Shining UVC on cooling coils in AHUs is by far the most efficient use of the UVGI technology. But if the HVAC system does not have AHUs or there is no HVAC system in place, one needs an alternate way to enhance the IAQ.

Dual-Purpose Device

To make air disinfection available everywhere in any closed space, it was decided to explore the concept of combining UV lamps with a suitable lighting system. By the late nineties, FTL and CFL were the most commonly used light sources which had largely replaced energy inefficient GLS and halogen MR16. Since then, FTL and CFL have been very rapidly replaced by LEDs, although the basic luminaire design has not changed significantly. The most popular luminaire versions have lamps suspended from ceiling or wall mounted. In offices 2 x 2 feet square down-lighter luminaires are more common. Arklite Speciality Lamps have created two products which incorporate LED lighting and UV lamps for IAQ enhancement.

A UV disinfection system has been incorporated into a 2 x 2 feet LED luminaire and named as LUVI Squire. This device could replace the false ceiling mounted 2 x 2 feet LED lighting units with added feature of continuous UV disinfection of the ambient air. In this device, besides LED lighting, air disinfection is achieved by a combination of UV disinfection and Photo Catalytic Oxidation (PCO) by nano particle coating on walls surrounding the UV lamp. The combination of UV and PCO also leads to reduction of particulate matter (PM 2.5 and PM 10) and odor reduction by oxidation of Volatile Organic Compounds (VOCs) in addition to microbial disinfection.

Hager et al. and Dashliborun et al. studied the effects of different parameters in the photo catalytic degradation of different organic pollutants and found out that the efficiency of degradation highly depends on flow rate, initial concentration of reactant, humidity, temperature and light intensity. According to their experiments, the conversion of different organic compounds was maximum at room temperature, low flow rates and low initial contaminant concentrations. These studies further emphasize on the necessity of such dual application (UVC + PCO) even in case of HVAC systems to remove the dependencies of PCO on flow rate, temperature and humidity conditions to get the required IAQ enhancement in the closed environment.

UVC & PCO for IAQ Enhancement

The germicidal properties of UVC, wavelength range 200 to 280 nm, are known for over a century. A low-pressure mercury lamp made from a UV transmitting glass mostly emits a 254 nm radiation which has a strong germicidal property. Each photon of 254 nm is capable of penetrating the cell wall of a bacteria and breaking bonds of its DNA. Bacteria are thus inactivated, incapable of replicating themselves. Viruses do not have a cell wall but their small size, 10 to 100 nm, makes them a difficult target. Thus, UVC photons are lethal to every microbe, although the dose needed for their inactivation differs.

Certain compounds when exposed to light of suitable wavelength release OH radicals which have very strong oxidizing properties. Nano particles of titanium dioxide are particularly effective when exposed to UV radiation. These OH radicals when interact with odor causing Volatile Organic Compounds (VOCs), eliminate and neutralize each other. The charged OH radicals also neutralize charge on particles of micron and sub-micron size, which help them to come together to make bigger particles which either settle down or are easy to eliminate by filtration.

Design of the system

The 2 x 2 feet LED square units are popular downlighters usually installed in false ceilings. In LUVI Square a 55 W UV lamp is placed inside an aluminium tube of square section and mounted on top of the 45W LED assembly. As shown in Fig1 there is blower which sucks the ambient air, passes it over the UV lamp and then releases it the room.

Remote Control

This system has three modes of operation. The first mode called the 'Disinfection Mode' in which only UV lamp is ON. In this mode the IAQ enhancement is achieved with the help of UV lamp and the PCO coating. The second mode is called 'Lighting Mode' in which only white light LEDs are ON. The third mode is called the 'Dual Mode' in which both lighting and UV lamps are on. In this mode, the IAQ enhancement is achieved using UV Lamp and PCO coating along with the lighting requirement. The remote control provided with the system facilitates the selection of desired mode. Alternatively, the ON/OFF switch that gives electrical power to the unit can also be used for changing these modes without remote control. For example, if the delay time is set as 5 seconds, the OFF time below 5 seconds will change the mode sequentially and if OFF time is more than 5 seconds then the system will restart in the same mode. All these operations are governed by the microcontroller based circuit provided in the system.

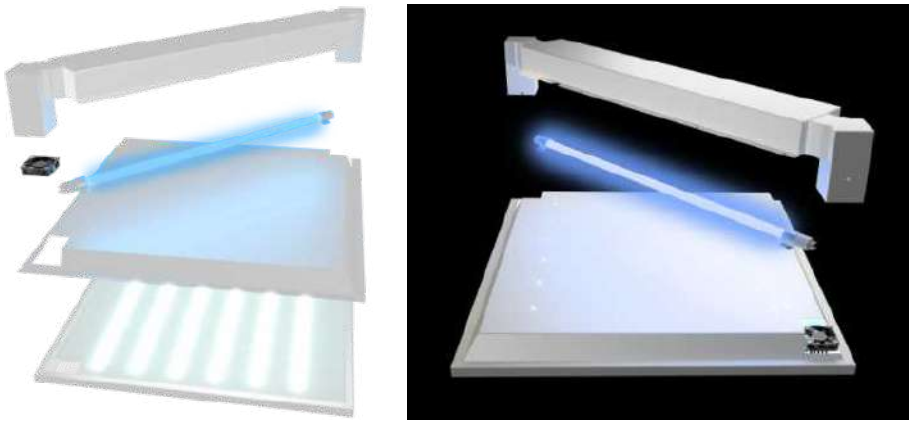


Fig 1: Exploded view of LUVI Square

Result and discussion

a **IAQ enhancement by Microbial Reduction:** The dosage required for Corona virus is 2mJ/cm^2, for Log1 or 90% reduction. The data reported from various papers for SARS-CoV-2 as well as for the other common respiratory viruses confirms the dosage level. Also, studies done by Kowalski et. al. show that dosage of 4mJ/cm^2 is useful for >Log2 reduction of influenza, small pox and TB bacteria. This system is designed to give a UV dosage of 4mJ/cm^2.

During this microbial testing the exposure was done for two durations, first after 2.5 hrs and second after 5 hrs in two separate locations. The location one was a cabin, 10 ft. X 10 ft. (100 sq. ft.) with one occupant. The location 2 was a large work hall of 52 ft. X 38 ft. (1976 sq. ft.) with 19 occupants during the testing. Both the cabin and work hall were equipped with common HVAC system. The cabin had two 2 x 2 feet lighting fixtures out of which one was replaced with LUVI Square. The work hall had 24 units of 2 x 2 feet LED lighting fixtures, of which 6 were replaced with LUVI Square systems. The LUVI Square systems were placed such that the distribution was uniform over the entire hall. The LUVI Square systems were used in the third mode i.e. 'Dual Mode' for the testing. The percentage inactivation of Bacteria for LUVI Square was measured by plate settle method. The petri dish with nutrient agar was exposed for 45 minutes during the experiment to get the Total Viable Count (TVC) in Colony Forming Units (CFU) and the same was converted in to percentage with before and after count. The TVC is the addition of the Total Bacterial Count (TBC) and Total Fungal Count (TFC). The results were as

Sr. No.	Location	Sample Site	Microbial inactivation (%)	
			@11:30 am, duration 2.5 hr	@2:00 pm, duration 5 hr
			TVC	TVC
1	Location 1	Cabin, Table	90.9	93.8
2	Location 2	Walk hall, Table No. 02	58.3	98.4
3		Walk hall, Table No. 24	59.9	97.3
4		Walk hall, Table No. 34	73.3	95.1
		Average of Location 2	**63.8**	**96.9**

Table 1: Microbial inactivation in the cabin and the work hall

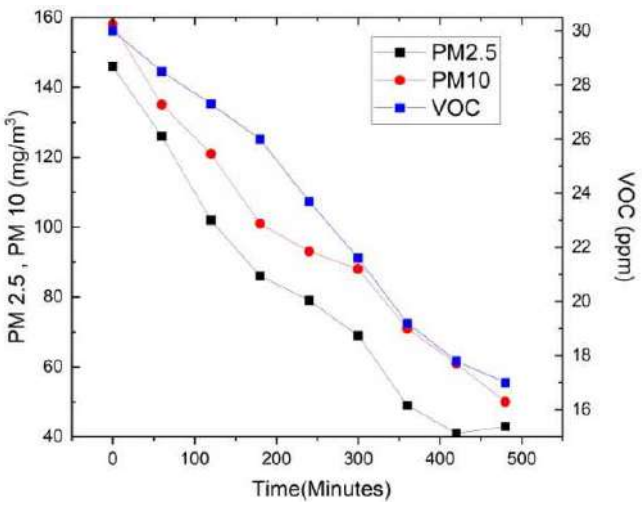
mentioned in Table 1.

The average percentage inactivation or microbial reduction in terms of TVC in air by LUVI Square was greater than 60 % after 2.5 hours in the location 2 work hall which increased to greater than 96 % after a time interval of 5 hours. The microbial reduction was above 90% even after 2.5 hrs at location 1.

The location 1 cabin with a volume of 900 ft^3 with one 8 CFM fan in the LUVI Squire will circulate the air once in about 112 minutes justifying the 90% reduction after 2.5 hrs.

The location 2 work hall had a volume of 17,784 ft^3 and with six fans of 8 CFM in the 6 units installed, the air will be circulated once through the 6 systems installed in the time of 370 minutes, this explains why there is only 60 % microbial reduction after 2.5 hrs and greater than 90% after 5 hrs.

b IAQ enhancement by VOC, PM2.5 & PM10 reduction: The system was tested for IAQ enhancement in the third mode (dual mode) for the time period of 8 hours in a room of 10 ft. X 10 ft. (volume of the room was 1000 ft^3) equipped with split ac unit. Before starting the experiment, the VOC and PM concentration in the room was increased by using spray of methanol and burning a paper respectively. The room was sealed before increasing the VOC and PM level. The natural rate of reduction of VOC and PM was noted which can be attributed to natural degradation by way of leakages and adsorption in the room without UV + PCO being turned on. These readings were used for subtracting from the actual data collected at with UV + PCO turned on. The VOC reduction in ppm and PM reduction in mg/m3 was plotted with time as shown in Graph 1. The percentage reduction of PM2.5 and PM 10 was almost 70% after 8 hours. The percentage VOC also reduced by 43% in 8 hours.



Graph 1: Measurements of VOC, PM 2.5, and PM 10 in dual mode of operation

It should be noted that in any closed environment all LED units need not be replaced by LUVI Square units. In a room with good lighting, as in the present case, every fourth unit is replaced by LUVI Square and the microbe inactivation of better than 90% was achieved. Clearly, if every third LED unit is replaced by LUVI Square the inactivation would be even faster.

Conclusions

In conclusion, the LUVI Square system gives a significant IAQ improvement in the centrally air-conditioned space. The system has shown performance matching well with the theoretical calculations in terms of microbial inactivation. The significant reduction in VOC and Particulate Matter is observed on account of UV+PCO coating. With very modest additional investment in the lighting cost a significant IAQ improvement can be achieved, particularly by way of drastic reduction of airborne infections.

Acknowledgement

Authors take this opportunity to acknowledge Mr. Nilesh Sonawane and Mr. Akshay Joshi for extending their support in carrying out VOC and PM measurements and Ms. Vinita Kulkarni for the efforts taken for carrying out the Microbial testing.

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There are total 12 references to the article; they can be obtained by writing to mandar.s@arklite.co.in

Patents for the dual purpose device for lighting and Indoor Air Quality have been filed for the concept as well as for the devices

Revision of National Lighting Code, SP 72

Standardization plays a crucial role in ensuring safety, quality, interoperability, energy efficiency, and sustainability in the field of lighting. By establishing common frameworks, technical specifications, and performance criteria, standards foster innovation, market access and consumer protection, ultimately contributing to a brighter, safer and more sustainable future.

Bureau of Indian Standards through its Illumination Engineering and Luminiaries sectional Committee, ETD 49 under ETDC, is responsible for formulation of Indian Standards for luminaires and codes of practice for interior/exterior lighting. National Lighting Code, SP 72 published by the Bureau of Indian Standards (BIS) in year 2010, signifies a crucial step towards addressing the diverse lighting needs and challenges in India. The intent of this code is to encourage good lighting practices and systems which would minimize light pollution, glare, light tresspass and conserve energy while maintaining safety, security, utility and productivity.

However, over the past decade, lighting has undergone significant advancements, driven by technological innovation. The widespread adoption of LED lighting technology has revolutionized the lighting landscape, offering substantial energy savings, longer lifespan, and improved performance compared to traditional lighting sources. Government schemes such as the Unnat Jyoti by Affordable LEDs for All (UJALA) program have played a pivotal role in promoting LED adoption by providing subsidized LED bulbs to households across the country. Additionally, initiatives like the Street Lighting National Programme (SLNP) have led to the deployment of millions of LED streetlights, enhancing visibility, safety, and energy efficiency in urban and rural areas alike. Furthermore, the focus on smart lighting solutions, including remote monitoring and control systems, is paving the way for more sustainable and connected lighting ecosystems in India's rapidly evolving urban landscape.

The need for the revision of the National Lighting Code is imperative to integrate the significant advancements that have occurred in the field of lighting over the past decade. With rapid technological progress and innovations such as LED lighting, smart lighting systems, and sustainable design practices, updating the code is essential to reflect the latest standards, best practices, and emerging trends

The revised draft for 'National Lighting Code of India' is divided into 17 Parts and 45 sections as follows:

Part 1	Lighting Vocabulary
Part 2	Physics of Light
Part 3	Electric Light Sources & Their Accessories
Part 4	Luminaries
Part 5	Interior Illumination
Part 6	Outdoor Lighting
Part 7	Energy - Effective Lighting Systems
Part 8	Day Lighting for Buildings
Part 9	Emergency Lighting
Part 10	Installation and Commissioning
Part 11	Human Centric Lighting
Part 12	Indoor Digital Connected and IOT Based Lighting
Part 13	Outdoor Digital Connected and IOT Based Road Lighting
Part 14	Adverse Effects of Lighting
Part 15	Horticulture Lighting
Part 16	Automotive Lighting
Part 17	Science of Ultra Violet & Ultra Violet Germicidal Irradiation Applications for Hospitals

Part 1 'Lighting Vocabulary' covers definitions and terms used in the field of lighting, ensuring a uniform understanding of each term within the realm of lighting.

Part 2 'Physics of Light' is devoted to properties and behaviour of light, vision and various colour aspects to the extent of understanding of physical characteristics of light which is indispensable for those involved in lighting practice.

Part 3 'Electric Light Sources & Their Accessories' specifically outlines the typical characteristics of the LED technology and LED drivers, covering their fundamentals, types, operating characteristics, classifications, specifications, applications, and DALI controls.

Part 4 'Luminaires' provides in-depth coverage of general aspects related to luminaires, encompassing their classifications, test methods, and the necessary equipment to ensure their safety, performance, and reliability.

Part 5 'Interior Illumination' serves as a comprehensive guideline for designing and implementing effective lighting solutions within interior spaces. It comprises of 9 sections covering different interior spaces such as industrial lighting, office lighting, lighting for educational facilities, hospital lighting, hospitality lighting etc.

Part 6 'Outdoor Lighting' emphasizes principles aimed at enhancing safety, security, and visibility while minimizing light pollution, glare, and energy consumption at outdoor spaces. It comprises of 14 sections covering different outdoor spaces such as landscape lighting, sports lighting, road lighting, tunnel lighting, high mast lighting etc.

Part 7 'Energy-Effective Lighting Systems' outlines the comprehensive guideline for promoting energy efficiency and sustainability in lighting

design, installation, and operation.

Part 8 'Day Lighting for Buildings' covers the general principles and methods of daylighting of dwellings, offices and hospitals.

Part 9 'Emergency Lighting' crucial guidelines for ensuring safety and functionality in emergency situations. It specifies the lighting levels, duration of illumination, and placement of emergency lighting fixtures to ensure visibility and accessibility in critical areas such as stairwells, corridors, and exit routes.

Part 10 'Installation And Commissioning' contains installation maintenance guidelines of indoor and outdoor lighting installations.

Part 11 'Human Centric Lighting' offers essential guidelines for designing lighting systems that prioritize human well-being, health, and productivity.

Part 12 and Part 13 'Indoor and Outdoor Digital Connected and IOT Based Lighting' emphasizes the integration of Internet of Things (IoT) and smart lighting solutions to enable remote monitoring, control, and optimization of indoor and outdoor lighting environments.

Part 14 'Adverse Effects of Lighting' is to understand the quality aspect of lighting so that the best selection is made to eliminate these adverse effects as possible in our real life installation.

Part 15 'Horticulture Lighting' outlines the terminology, quantifiable illumination metrics to determine the effectiveness of the output of a luminaire (Horticultural Lighting) on plants.

Part 16 'Automotive lighting' establishes essential guidelines for the design, installation, and operation of lighting systems in vehicles.

Part 17 'Science of Ultra Violet & Ultra Violet Germicidal Irradiation Applications for Hospitals' emphasizes the use of UV germicidal irradiation (UVGI) to mitigate the risk of healthcare-associated infections by effectively disinfecting air, surfaces, and medical equipment.

The revised draft code is under wide circulation for seeking feedbacks/comments from concerned stakeholders. All concerned stakeholders are urged to provide their comments extensively during the wide circulation period to ensure its relevance and utility within the lighting community. Comments can be submitted through BIS website or vide email to eetd@bis.gov.in in the prescribed format. The revised National Lighting Code of India is anticipated to be released by October 2024.

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Signify empowers visually impaired students with computer labs in Gujarat

Signify took a significant step towards fostering inclusive education by inaugurating four computer labs in blind schools across Gujarat, another initiative under their Corporate Social Responsibility (CSR).

The execution of this noteworthy project was entrusted to Samarthanam Trust for the Disabled, Signify's dedicated NGO partner. The impact of this endeavour is substantial, with over 350 visually impaired students benefiting from the newly established computer labs. Signify's commitment to making a positive difference is further reflected in the fact that this project extends support to a total of 26 blind schools across India.

Commenting on the project, Nikhil Gupta, Head of Marketing, Strategy, Govt. Affairs & CSR - Signify, Greater India said, “Our CSR strategy and initiatives resonate with our brand purpose which is to unlock the extraordinary potential of light for brighter lives and a better world. At Signify, we are committed to empowering underprivileged communities and the inauguration of the computer labs in blind schools is yet another testament of that. With this initiative we hope to provide students with the necessary aid for their education and development, lighting up their future for a better tomorrow.”

The newly equipped computer labs are set up in the following blind schools; 'SURABHI' Lions Blind Girls School in Vadodara, Samajsuraksha Sankul and Resource Centre in Vadodara, Andhajan Shikshan Mandal in Surat and Andhjan Shala in Shavarimal.

This initiative aligns with Signify's commitment to leveraging technology for social impact, creating an inclusive environment, and contributing to the overall development of communities. By focusing on education for visually impaired students, Signify is paving the way for a brighter and more equitable future.

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ELCOMA GB held at New Delhi

The first Governing Body Meeting of ELCOMA for 2024 which was sponsored by OSRAM Lighting was held on 17th January 2024 at the Sampan Tea Room, The Suryaa Hotel, New Delhi. Eleven members of ELCOMA GB were present in the meeting. Mr. Avinder Singh, President, ELCOMA, welcomed everyone and read the minutes of the previous Governing Body meeting held on 22 September 2023 which was approved and then proceeded to start the meeting. After the President's address, Mr. Amal Sengupta, Secretary General of ELCOMA read out Secretary's points to the GB. The committee reports were presented by respective chairpersons of the committees, namely Mr. Nitish Poonia and Mr. Santosh Agnihotri. There was a discussion of Light India + LED Expo 2024 initiated by Mr. Amal Sengupta and also the plan for organizing ELCOMA conferences.

Mr. Avinder Singh announced that Mr. Nirupam Sahay, would be leaving Dixon and that his position, as Treasurer of ELCOMA would be filled in by Mr. Amit Mittal, Business Head- Lighting Solutions, Dixon Technologies.

The meeting came to an end with a vote of thanks by the President. Mr. Mohit Sharma volunteered to sponsor the next GB by Eveready, which will be held in Kolkata in April 2024.

Halonix launches a revolutionary 'Wall De-light'

Halonix Technologies, one of India's fastest-growing electrical companies, launched its latest product, 'Wall De-light', that sets new benchmarks in aesthetic design and is six times slimmer than a traditional LED bulb, and it does not require any additional fixture.

This aesthetic wall lighting fixture is based on Halonix's proprietary Unifit Technology, which ensures that it is mounted flush with the wall and is very simple to install. It is available in two contemporary 12W LED shapes – Round and Square, priced competitively with a warranty of 2 years. Its innovative features blend design and functionality, making it a reliable and cost-effective lighting solution.

Speaking about this launch, Rakesh Zutshi, Managing Director, Halonix Technologies, shared, “We are committed to pioneering innovation and providing cutting-edge lighting solutions for modern household and institutional needs. The new launch is a testament to our unwavering perseverance, and our dedicated R&D and design teams continually strive to push boundaries, creating unmatched products tailored to meet the demands of the Indian market. With Wall De-light, we have been able to bring a new dimension to wall lighting. Our research with consumers confirms that we have a winning innovation at hand.”

Signify launches the power-packed Philips Deco Range

The Philips Deco Collection offers a stunning array of decorative luminaires in various shapes allowing you to design a lighting scheme that complements your unique office aesthetic. These luminaires go beyond aesthetics, delivering exceptional performance with features like:

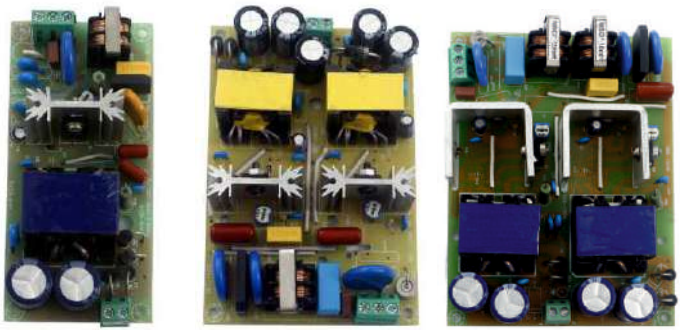
- **Energy Efficiency:** energy-saving LED technology, reducing environmental impact and lowering operating costs.
- **Superior Light Quality:** exceptional brightness, color rendering, and flicker-free operation
- **Easy Installation:** Seamless integration into existing infrastructure and minimizing disruption

For those seeking a more minimalist and linear aesthetic, **the Philips Deco Functional Linear Range** offers the perfect solution with exceptional functionality, providing key features like:

- **Visual Comfort:** Delivers ample, uniform light distribution throughout your workspace
- **Dimming Capabilities:** Allows for easy adjustment of light levels to create the perfect ambiance
- **Seamless Integration:** The linear design ensures these luminaires integrate seamlessly into various office layouts and ceiling designs

JAP Introduces Variable Current Series LED Drivers

Just About Power (JAP) recently unveiled its latest innovation, the Variable Current Series drivers. These drivers are engineered to redefine LED lighting control and this series introduces a revolutionary component known as the trim-pot (commonly known as a variable resistance device), granting users unprecedented flexibility in lighting applications. The biggest advantage of the Variable Current Series lies in its adaptability, enabling a single driver to effortlessly cater to multiple ratings. This versatility not only simplifies inventory management but also offers cost-effective solutions for diverse lighting needs and allows designers to explore boundless possibilities in LED lighting design and implementation, setting new benchmarks in efficiency, reliability and performance.



These drivers provide

a Tailored Output Current: With a simple adjustment of the trim-pot, users can tailor the output current to precisely match the requirements of their LED lighting system. This flexibility ensures optimal performance and efficiency, accommodating a wide range of lighting configurations and designs.

b Optimized Input Power: Fine-tune the trim-pot to synchronize input power with specific demands, optimizing the driver's performance to meet desired power consumption levels. This intelligent feature not only enhances energy efficiency but also ensures seamless compatibility with diverse power input conditions.

Designed with user convenience at its core, the Variable Current LED Drivers feature a user-friendly trim-pot component, allowing effortless adjustment of variable resistance. With a simple screwdriver, users can tailor the driver to their exact application needs, streamlining installation and setup processes.

These are available in three variants to suit various requirements.

- Up to 80-100W: Compact dimensions of 114mm (L) x 54mm (W) x 37mm (H), supporting a maximum current of 2000mA.
- Up to 110-150W: Sleek design measuring 117mm (L) x 79mm (W) x 32mm (H), delivering a maximum current of 2800mA.
- Up to 150-180W: Spacious build of 131mm (L) x 100mm (W) x 37mm (H), accommodating a maximum current of 3200mA.

TUNEL by BAJAJ

Bajaj recently launched its state-of-the-art Tunnel Lighting product called TUNEL.

Tunel stands out due to its well though-out design that ensures traffic safety across all zones of tunnel. Its innovative design allows for seamless continuous rows that lead to best lighting values making it the optimum solution for traffic safety and maximum visual comfort in tunnels. The product is simple and compact luminaire with great flexibility that ensures easy installation and maintenance with uniform illumination ensuring good visual guidance

Key product features

- High quality polycarbonate LED lens
- Extruded aluminium housing with high thermal conductivity
- High quality anti-corrosion materials for all load bearing parts, all hardware used is stainless steel SS316
- Well thought out intelligent features easy and mounting brackets for convenience
- Construction and mechanical protection modular design for easy maintenance

- Constant current driver used is specially designed to have built in surge protection, open/short circuit protections. External surge protection provided for additional safety.

Appointments

Amit Mittal joins Dixon Technologies as Business Head- Lighting Solutions

A Graduate in engineering from Punjab Engineering College, Chandigarh, Mr. Mittal has more than 25 years of experience in manufacturing operations in different industries out of which almost 20 years is with Lighting. His latest experience was with a Dutch MNC leading their Green Field Project in Pune and with Philips where he was the Plant Head for Mohali Factory and Outsourcing Operations Lead for LED Lamps. He is a Lean master and Certified Six Sigma Black Belt.

Puneet Dhawan joins LEDVANCE India as Managing Director

Mr. Puneet Dhawan has had an illustrious career spanning over 34 years in the lighting industry, including notable positions at esteemed brands like Bajaj, Crompton, and Orient Electric. Mr. Dhawan's wealth of experience and comprehensive understanding of industry dynamics uniquely position him to drive innovation, forge strategic alliances, and steer Ledvance India towards sustained growth and success.

Ravi Kumar Dhulipala Joins Jaquar Lighting as Business Head

A seasoned Chemical Engineer with an MBA from the esteemed Indian School of Business, Mr. Ravi Kumar Dhulipala, has a wealth of experience spanning over 27 years across FMCG, Energy, and Industrial sectors. He has traversed pivotal roles within distinguished organizations such as GE, BP, Ingersoll Rand, and Unilever. Notably, prior to joining Jaquar Lighting, he spearheaded a US$ 200 million P&L in the industrial domain based in Muscat, Oman, catering to a diverse spectrum of industries from beverages to aviation.

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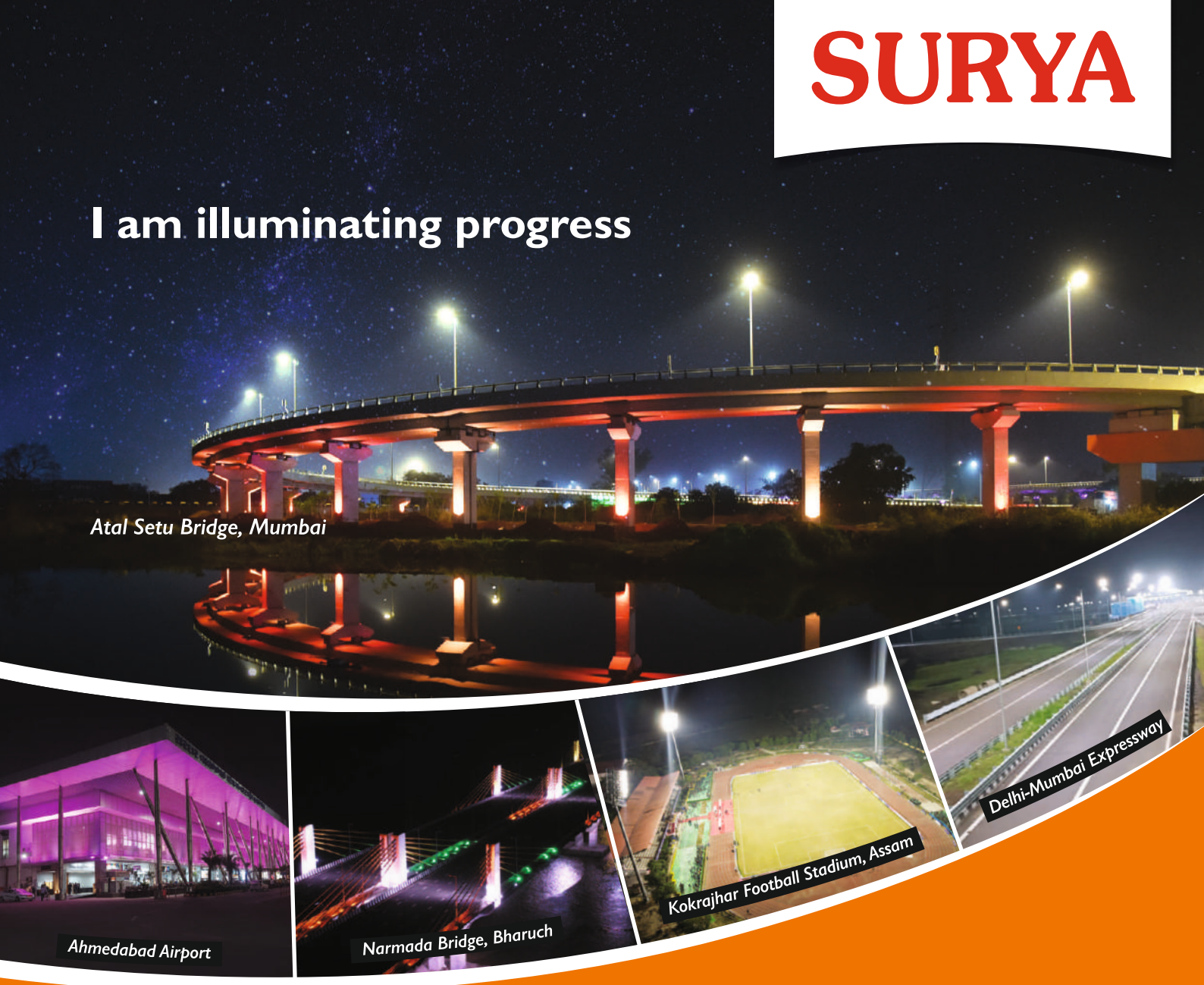

Surya Roshni shines on India's Longest Sea Link

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