MAKE IN INDIA...
Beyond Luminaire Manufacturing

DVRS Sastry
+91 9969662948
sastrydvvr@gmail.com

DVRS Sastry is a seasoned professional with more than 30 years experience in the lighting industry. He has held significant roles, including serving as Technical Expert in the area Product Development and Technology at Bajaj Electricals Ltd. And Crompton Greaves Ltd.. Currently, he is working as Technical Expert in area of Lighting in an EPC company having global foot print across the world.

The Make in India initiative was launched in 2014 to transform India into a global manufacturing hub. This initiative has not only boosted manufacturing in the country but has also increased employment opportunities for millions of people. The lighting sector is one of the many industries that have been able to leverage the Make in India initiative for maximum employment and expansion in the country. According to a report by ResearchAndMarkets.com, the Indian lighting market is expected to grow at a CAGR of 12.7% during the period of 2021-2026. The demand for energy-efficient lighting products is on the rise due to the increasing need for sustainable development. The government has also been promoting the use of energy-efficient lighting products to reduce the country's carbon footprint. The lighting industry in India has completed a long journey. LED lighting has changed the dynamics of lighting industry.

The Make in India initiative has provided an excellent opportunity for the lighting sector to cater to the growing demand for energy-efficient lighting products. The government has introduced various schemes and incentives to promote the manufacturing of energy-efficient lighting products in the country. These schemes have not only boosted the manufacturing of lighting products but also increased employment opportunities in the sector This is due to the increasing demand for energy-efficient lighting products in the country. In this article, we will explore how the LED lighting sector is leveraging Make in India for maximum

employment and to expand the sector:

Lighting technologies have completed a long journey. In 2007 , it was indicated that lighting for general illumination accounts for more than 8% of the world's primary energy consumption. However, the technology used in traditional lighting (e.g., incandescent, fluorescent, and high-intensity discharge lamps) is not very efficient and converts less than 25% of the input energy into useful light. Solid-state lighting (SSL) is a rapidly developing technology whose efficiency of converting electricity into white light may reach 50% in the next few years. Additionally, this technology will be used in many applications such as Visible Light Communication (VLC). The above reasons force researchers to find cost-effective energy-saving solutions, and over the years, the Light-emitting diode (LED), which is a form of SSL become part of our daily lives.

LED is driving a significant transformation in the lighting industry by offering enhanced energy efficiency, durability, design flexibility, and advanced features. As technology continues to evolve, LED lighting is likely to play an increasingly central role in shaping the future of lighting. Moreover, LED lights have found applications in various technologies beyond traditional illumination. The characteristics of LEDs, such as their energy efficiency, compact size, and ability to emit light of different colours, make them suitable for a wide range of applications.

In case, we become particular towards the domestic scenario, the manufacturing of LED lighting products in India has gained momentum in recent years due to the increasing demand for energy-efficient and eco-friendly lighting solutions. The Indian government's initiatives to promote the use of LED lighting and reduce energy consumption have further boosted the LED industry. Overall, the manufacturing of LED lighting products in India is a dynamic and growing sector, driven by a combination of government support, market demand, and a focus on quality and innovation. The industry's continued development contributes to energy conservation, environmental sustainability, and the creation of employment opportunities in the country.

2. Self-reliance India in manufacturing of LED lighting

2.1. Domestic Manufacturing

2.2. Energy Efficiency

2.3. Reducing Imports

2.4. Incentives and Subsidies

2.5. Research and Development

2.6. Skill Development

2.7. Safety and Quality Standards

2.8. Export Promotion

3.1 Increased employment opportunities

3.2 Reduced Dependence on Imports

3.3 Technological advancement

3.4 Increase in the use of LED lighting products

3.5 Reduction in the cost of LED lighting products

4. Challenges in the way of self-reliance in LED lighting

While India has made significant strides in promoting self-reliance in the manufacturing of LED lighting, there are several challenges that the country is facing in achieving full self-sufficiency in this sector. We may broadly segregate the challenges into two categories, general challenges and technological challenges.

4.1. General challenges:

- Heavy Dependence on Imports
- Global Competition
- R&D Investment
- Quality Control and Standards
- Supply Chain Challenges
- Cost of Production
- Infrastructure and Power Supply
- Economic Uncertainties
- Environmental Regulations
- Scale and Volume
- Skills Shortage
- Lack of Integrated Ecosystem

3.2. Technological Challenges:

- Component Availability
- Technological Innovation
- Quality Control

- Efficiency and Heat Management
- Colour Consistency
- Smart Lighting Integration
- Environmental Considerations
- Testing and Certification
- Energy Efficiency
- Miniaturization and Form Factors
- Harmonizing with Power Supply
- Customization and Specialized Products

5. Applications of LEDs are beyond lighting

The typical properties of LED lights like their energy efficiency, compact size, and ability to emit light of different colours, make them suitable for a wide range of applications [10]. The versatility of LED technology and its integration into various fields contribute to advancements in efficiency, performance, and functionality across different industries. In this connection, some notable examples are given below:

5.1. Electronic Displays

5.2. Backlighting for Screens

5.3. Automotive Lighting

5.4. Traffic Lights and Signals

5.5. Medical Devices

5.6. Horticulture Lighting

5.7. Street Lighting

5.8. UV-C Disinfection

5.9. Consumer Electronics

5.10 Phototherapy in Medicine

5.11. Communication Systems (Li-Fi):

6. Futuristic technology in LED lighting

OLED Lighting

Li-Fi (Light Fidelity):

Quantum Dots:

- Human-Centric Lighting
- LiDAR and Gesture Control
- UV-C LED Disinfection
- Li-Fi Indoor Positioning
- Integration with IoT
- 3D Printing of Light Fixtures
- Energy Harvesting LEDs
- Nanotechnology
- Solar-Powered LEDs

7. Way forward

Despite these challenges, India's initiatives and policies aimed at promoting self-reliance in LED manufacturing are making progress. The government and industry stakeholders are working together to address these issues and create an environment conducive to domestic LED manufacturing and innovation.

A recent report indicates that with the support of the government in the form of ambitious national Semiconductor projects and initiatives of industry, India is going to penetrate the global market of the semiconductor industry. According to the reporting, India makes strides in semiconductor manufacturing with small, and inexpensive LED driver chips.

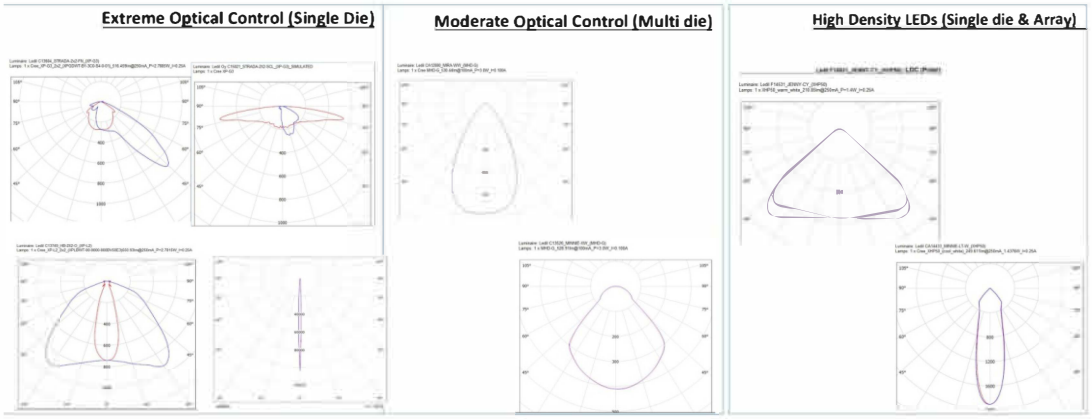
To overcome these technological challenges and promote self-reliance in LED manufacturing, India needs to invest in research and development, encourage collaboration between industry and academia, and provide incentives for the development of innovative technologies and processes. Additionally, fostering a supportive ecosystem that includes specialized suppliers and testing facilities can help Indian LED manufacturers stay competitive and technologically advanced.

The futuristic technologies in LED lighting are expected to offer improved energy efficiency, innovative designs, and enhanced functionality for a wide range of applications, from residential lighting to smart cities and beyond. As technology continues to advance, LED lighting is likely to become even more versatile and integrated into our daily lives.

In Conclusion:

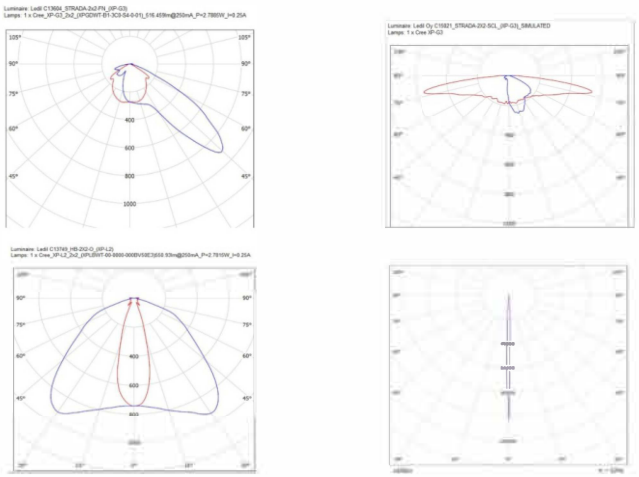
In conclusion, by prioritizing the adoption and rigorous implementation of key advancements—namely, optimized LED and optics selection, the integration of new-generation beam control technologies, and the utilization of cutting-edge driver solutions—the Indian luminaire industry possesses the potential to achieve parity with global leaders in the lighting sector and establish a competitive presence in the international market.

How to achieve higher installation efficiency : Right LED+ Right Optics



- Both symmetric, double symmetric, narrow beam and wide beam street light possible
- Various symmetric beam options possible
- Symmetric and asymmetric beam options available with suitable optics

New Generation Beam Controls



Employing different beam options optimized for specific project

New Generation Drivers