

LED REVOLUTION AND CONSERVATION OF ENERGY IN INDIA

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ABSTRACT

In a developing country like India, there is increasing demand of more energy for the developments in all sectors on one side while, the need for conservation of energy on the other. It is acknowledged that India needs to conserve its energy in order to manage the demand and supply gap to facilitate the growth rate in future. It is also recognized that the huge consumption of energy needs to be managed in terms of saving, controlling pilferage, optimum utilization, load distributions and meeting the necessity of the consumers. Lighting alone consumes 18% of the total energy produced. This sector is significant to look at for the sake of conservation of energy. In future, Lighting Emitting Diode (LED) will be the most important light source that would illuminate India on a large scale.

Keywords: Heat Sink, Light Emitting Diode (LED), Power quality, semiconductor.

INTRODUCTION

In a developing country like India, the production of power generation is equally important to the maintenance of quality of power. This is extremely necessary to ensure the sustainability and to keep up the development in a positive direction. If the quality of the power is not standardized and consistent, the consumers at the end would be the worst hit. Power is consumed in various applications and the average life of the instruments being run on electricity is quite short if the power quality is not standard. With more and more electronic devices in use, the need to control the power quality has become very important. This issue needs to be given prior attentions by both the Government and the industries for the benefit of both as the quality of power is not up to the mark in India. The key driver of Indian Government policy is the need to enhance the energy efficiency across all sectors. Optimists in India peg the achievement of growth rate at 8-9% and to achieve same, three to four fold primary energy production needs to be ensured by the year 2031-2032. This is the scale of energy production that is required to eradicate poverty and enhance the living standard of the average citizen of India.

POWER QUALITY-DOWNWARD PLUNGE?

There are various factors which are responsible for the low power quality such as Voltage Sag, Voltage Swell, Transient, Harmonics, Voltage Unbalance, Frequency Deviations, Flicker and inrush Current. These factors have had a significant impact on the Lighting industry for a long time. Keeping in line with the intention of conservation of energy in Lighting industry, the most modern technology that are being established is Light Emitting Diode (LED) which is being implemented across the country in the coming decades. LED is semiconductor and is electronic in nature and hence the quality of power is the important factor to ensure the life span of LED lighting in all its applications.

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In India, the power supply in high voltage mains has a range from 110 to 230 volts. This wide range has fluctuations having smaller and larger values but in case of LED, it requires consistent DC current in forward direction to remain operational in safe, effective mode. This will also make the devices last long.

The fluctuation of current damages the LED chips and the device with LED chips start degrading. Therefore, the first management needs to be done on the DRIVER which is an electronic circuit which converts input power into a current source and the current remains consistent in spite of fluctuation, over voltage and voltage spikes. The power current is directly responsible for the light output from the device and therefore the Driver needs utmost attention with all kinds of care in order to make the LED a success

In the recent past, LED has emerged as the forerunner in this evolution not only in India but globally. In India, LED has been the most discussed subject in economizing power usage because of the following reasons:

- The upsurge of the semiconductor industry in India;
- The development of the electronics industry in India;
- Power savings are to the tune of 50-60%;
- The LED system is almost maintenance free;
- New technology and provides clean energy;

To accelerate the process, the Indian Government has developed policies to stimulate the adoption of LED Lighting in the country, and is funding a number of pilots *LED* street-lighting projects.

LED- REVOLUTION

LED product making is an easy phenomenon. The LED chips are supplied by the chip manufacturers, heat sink by heat sink manufacturers, power supply by power supply manufacturers and the balance assembly can be done in a small workshop (factory). The product is connected with electricity which will endure 12-14 years of life and ensure a huge conservation of energy. Most of the products required to make LED light were sourced from China, but now there are large number of LED companies operating in Indian lighting domain. Earlier Indian Government as well as lighting experts promoted the continuous imports from China, Taiwan and Korea without considering the quality of power, climate, environments and the expertise.

Let us understand what LED lighting system is:

- LED lighting products are not a single product but a combination of Light source (chip), Heat Sink, Driver, Controller and in some cases "Lenses."
- Each component has a different function to contribute to make a perfect LED product be it in indoor or outdoor application.
- Each function needs to be properly organized in accordance with the time span to maximize the lifespan of LED light as they are all interdependent and one's failure does not stand in the way of other's success. This is the most critical area to look at, as far as India is concerned.
- The chip manufacturers claim the life span of the LED chip as 50000 burning hours. If the device operates 8 hours each day, the light should last for 12 years.

Let us examine the function of each component and the availability in India.

LED Light Source (Chip): The power LED chips are manufactured by a few companies in the world like Philips, Osram, Cree, Nichia, Samsung and Seoul Semiconductor.

Heat Sink: As LED H-P junction generates heat, it needs to decapitate. Heat sinks are made of metal alloy and mainly manufactured in South Korea and Taiwan. These are being marketed in the Indian market through representative companies. Few Indian companies have started manufacturing the luminaires as per the dem and design specifications.

Driver: This ensures the consistent forward current supply to chip and being manufactured in India. But the electronic driver manufacturers are very few in numbers.

Controller: This controls the lumen/watt of the device. Few international companies have started their manufacturing operations in India.

Optics or Lenses: This is necessary to distribute the light to cover more area as LED light is directional in nature. The quality lenses are not manufactured in India and being 100% imported.

The picture of LED manufacturing in India is given in **Table 1**.

Table 1: Status of LED Technology in India

Technology	Under trial
Climate	Under testing
Skilled R&D	Not available
Retrofit	No
Manufacturing	Partial, mainly assembly
Replacement	No
Specifications	yes
Standards	Only 6 national standards are available
Standard of Power Quality	Not available

In the 12th Five year plan, the power generation capacity in India is targeted to reach close to 1000 GWatt against the present capacity of 225 GWatt and the Lighting industry is expected to conserve energy to 15% from the 18% consumption. In such scenario, there are large numbers of management initiatives which can be listed as follows:

MANAGEMENT INITIATIVE

- Standards of Power Quality:** In many developing nations, the production of power gets the prime importance to meet the demand rather than to provide power quality and India is no exception. To ensure power quality and to minimize the pitfalls the Bureau of Indian Standard (BIS), the national body for the standardization must bring out a national affordable Indian standard in consultation with the IEC and the IEEE. In this exercise, the stake holders would be the Government bodies, Power generation companies, Power distribution companies, Power Grids and major industry consumers. After the formation of the standards there would be a mandatory mechanism of implementation and periodic controls across the nation. BIS the highest body for the specifications and standards in India is engaged to formulate the new standards for LED lights and luminaries as per the suitability of Indian climatic conditions. The specifications will ensure standard practice in manufacturing the products and in turn gain the customer confidence through proper testing. This exercise would result in a major conservation of energy.
- Power Engineers:** Ministry of Education should formulate a national strategy to install the Power engineering courses in the engineering institutions across the country because to implement the standards, India would need a huge number of Power Engineers who will explore topics related to the generation, distribution, transmission, and storage of electrical power. This work can include the design of new systems as well as evaluations of existing grids and equipment to determine when they will need upgrades and what kinds of upgrades may be necessary. Power engineers can act as safety inspectors/watch dog to check on conditions at working power supply in exterior and interior building lights, recessed lights, flag pole and sculpture lights, pole lighting in streets, parking lot and pedestrian lighting, electrical and security systems, parking structure electrical systems and including lighting etc.
- Driver:** The driver plays an important role in the life span of a LED lighting device and most of the incidence of failure is due to the inefficient quality of driver. In the LED products domain, there is no dearth of technology, chip, heat sink and optic but drivers needs to be designed to suit the Indian conditions and make it capable of ensuring the LED product life cycle.
- Establishment of Testing Laboratory:** Initiatives are to be taken by the private and Government to establish modern testing facilities across the country to ensure the correct testing data and hence certification.

CONCLUSION

Success of management of conservation of Energy in the perspective of Lighting industry can be measured only through appropriate improvement in the power quality and the power supply to the LED products with the help of qualified Power engineers. If these corrective steps are taken, the country will take a giant leap forward towards the conservation of energy through LED revolution road map in the coming years.

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