

LED lamps in modern life

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Light-emitting diode (LED) lamps are widely used nowadays in a variety of equipment and installations. What are the characteristics, advantages and applications of LED lamps you will learn from this article.

A light-emitting diode (LED) is an electronic light source that uses the phenomenon of electroluminescence discovered in the early 20th century. LEDs are based on the semiconductor diode that when switched on, allows electrons to recombine with holes, and energy is released in the form of light [1].

The beginning of visible LEDs dates back to the year 1962 when Holonyak and Bevacqua reported on the emission of visible light from gallium arsenide phosphor semiconductor junction [2]. Although the emission was only observed at low temperatures, the devices worked as LEDs and emitted visible light even at room temperature. After some decades of production, technology improved and today these devices are replacing a lot of traditional lamps.

LEDs have advantages and disadvantages when compared with other light sources, such as neon lamps. The *advantages* are:

- small size
- low power consumption
- low self-heating
- longer lifetime (about 25000 to 100000 hours depending on heat and current settings)
- high reliability
- they can be switched on and off quickly
- they are resistant to shock and vibration

The features that sometimes can be considered *disadvantages* are:

- the narrow viewing angle
- near monochromatic light
- limited wavelength selection

- more exact (than for traditional light sources) current and heat management required

The failure rate of early LED devices was due partly to manual component assembly. In the 1980s when a new material – gallium aluminium arsenide was developed, a rapid growth in the use of LEDs began [3].

The low energy consumption, low maintenance and small size of modern LEDs have led to their vast application. *Large area LED displays* are used as stadium displays and as dynamic decorative displays. *Thin, lightweight message displays* are used at airports and railway stations, and as destination displays for trains, buses, trams, and ferries. They are also used as low-energy replacements for traditional light sources applications such as illumination and automotive lighting, while *their high switching rates* are useful in communications technology that do not involve human visual system. *The single colour light* is well suited for traffic lights and signals, exit signs, emergency vehicle lighting. *Red or yellow LEDs* are used in environments where night vision must be retained: aircraft cockpits, submarine and ship bridges, astronomy observatories and in the field, for example for night time animal watching and military field use.

Recently, because of their fast switching times, LEDs have been used for automotive brake lights, truck and bus brake lights and turn signals. The significant improvement in the time taken to light up improves safety by giving drivers more time to react. LEDs are currently experiencing the most rapid market growth of their lifetime.

Bibliography:

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