

Did you know...

...the potential of LED technology?

ELC member companies, who account for 95% of lamps made in the EU, have striven over the last two decades to improve the environmental and functional performance of their products with leading edge innovation. A large variety of lamps are now available for all main lamp application areas and recent innovations in Light Emitting Diodes, commonly called the LED, looks set to extend these applications and possibilities further; offering new and significant functional and environmental improvements to a broad range of users.

About the LED

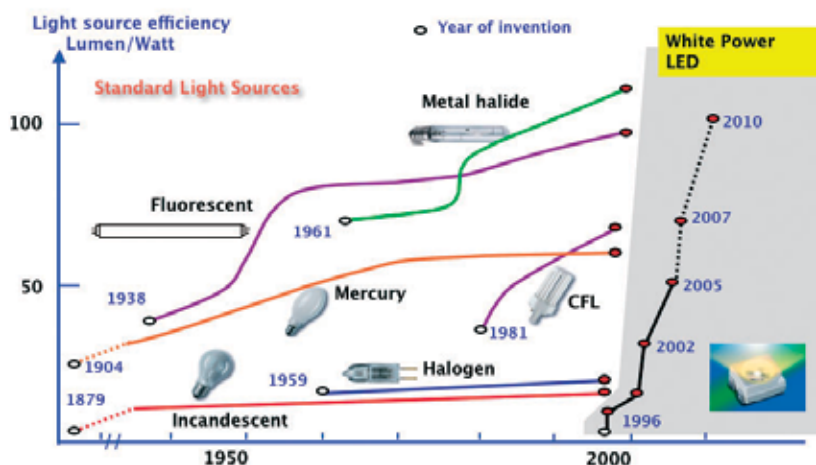
The LED is versatile in many different job applications and can already be found in a range of applications where reliability, colour, visibility and long life are important. This technology has been used for more than 30 years. For example: we are all familiar with the LED in our video recorder and similar equipment, indicating that the equipment is switched on. The LED can now be found in signal lighting, traffic lights, automotive lighting and also in home entertainment equipment. More recently, the LED is used in the backlighting of modern equipment, and in its latest lighting application as accent and decorative lighting, for indoors and outdoors.

How the LED evolved from a colour indicator lamp to become the preferred light source and even lifesaver in automotive applications:

- Reduced power consumption: 4W compared to 21W for brake mode and less than 1/2W for tail mode
- Increased driver safety: LED illuminate 99% faster than incandescent car lamps resulting in a reduced stopping distance of 8 m at 100kph
- Eight meter equals the length of up to 2 cars and can be the difference between life and death in a head-tail collision



Light Source Efficiency Roadmap



LED technology is known for a host of performance advantages, including their outstanding energy efficiency, optical efficiency, less weight and packaging due to a compact design and increased reliability and flexibility. This flexibility allowed the LED into applications where standard lamps would not work. Now, convinced of the potential in other areas, lamp manufacturers are undertaking a significant amount of development work on LEDs for a whole range of applications. So how do they work?

LEDs – How do they work?

Put simply, the LED are tiny light sources that fit easily into an electrical circuit but unlike ordinary incandescent bulbs, they do not have a filament that will burn out. Just a few millimetres long, they emit light by the movement of electrons in a semiconductor material which converts electric current directly into light.

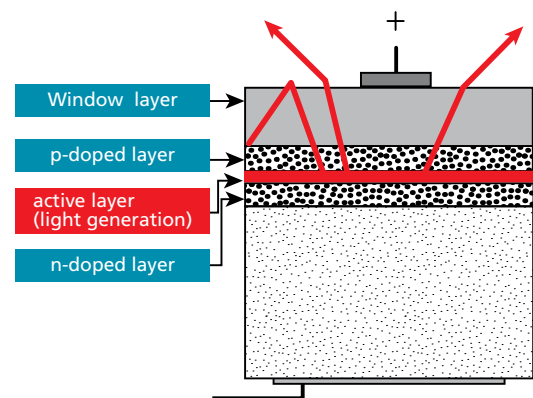
A LED consists of several layers of semiconductor material. If the diode is operated in a forward direction, light is generated in one of these thin layers, the active layer. In contrast to the incandescent lamp, that produces a continuous spectrum of light, the LED emits light of a particular colour or wavelength depending on the material used at the base of the chip.

White light is made in 2 different ways:

1. by mixing red, green and blue LED light; or
2. by depositing a phosphor layer on top of a blue LED.

The blue LED in more recent years, has increased in both reliability and flexibility; and made it possible to enter the General Lighting market with white light applications.

Cross-section of a LED



How the LED became the most important light source for the traffic light:

- Up to 90% energy saving compared to conventional light bulbs
- Longer life and extreme reliability results in reduced maintenance and lower running cost
- Conventional lamp failure may result in a non-functioning traffic light: use multiple LED solutions secure continuous function at all times, increasing traffic safety
- The LED requires no reflector as with conventional lamps, thus there are no problems with sunlight reflections in the traffic light (known as the phantom effect)
- The LED requires low voltage supply, which results in safer installations



The advantages of LED technology

Like many recent technologies the LED, particularly in a number of commercial application areas, are continuously developing and improving in performance. That said, the technology is already functioning in ways that could not be done before and with clear benefits to society as a whole, which are described below.

Performance over life

LED systems are almost maintenance free and their total cost of ownership¹ is significantly lower. The lifetime of the LED is considerably longer than a conventional lamp. Furthermore, unlike many filament lamps the LED, are not subject to sudden failure, they gradually dim over time rather than failing abruptly like an incandescent at the end of its life². Because of this, new definitions for “lifetime” have been agreed upon by the European lamp industry and now the lifetime of LED is expressed in the number of hours before a certain reduction in light output (30% or 50% depending on the typical application) occurs. Special attention is required for the life of the electronic gear that drives the LED, which should be equivalent in lifetime, of the LED.

Their long life clearly makes the LED attractive for places where changing bulbs is difficult or expensive, like on the outside of buildings or in traffic signal lighting. In certain applications where regular redecorations are common (e.g. shop lighting) the LED lighting doesn't require any attention over this period of many years.

¹The total cost of ownership of a product represents the cost incurred throughout its life cycle. For energy efficient lamps, although the consumer purchase price is higher than conventional less energy efficient lamps, the total cost of ownership is significantly lower as the lamp is replaced less frequently and uses less energy, with a consequently lower cost for electricity consumption for the consumer.

²The “end of life” definition for LED's has therefore been adapted by the lighting industry and is now defined as the moment until there is no longer sufficient light coming from the LED to fulfil its lighting task, which may differ per application.

Safety

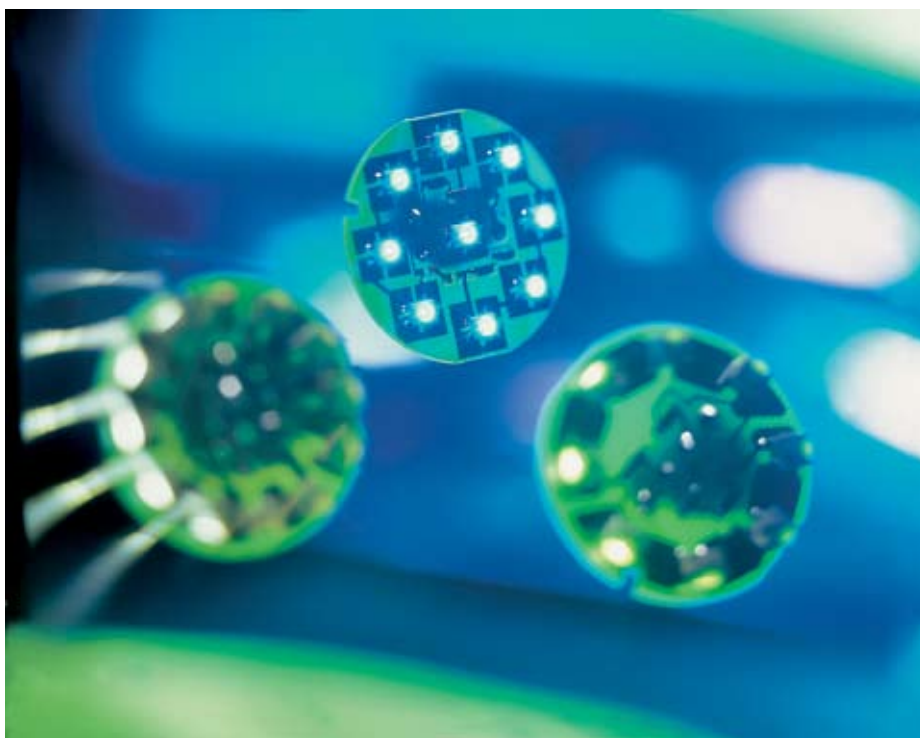
The LED can be operated with low voltage, making them safer and easier to work with. They produce less heat than incandescent lamps and are less fragile than fluorescents. They are built inside solid cases that protect them, they show no moving parts, no fragile glass, no exposure to toxic gasses and no filament making them hard to break and extremely difficult to cause damage. Given that they contain no mercury, they are also friendly for the environment.

Efficiency

In the last few years, the energy efficiency of the white LED has increased significantly, a trend that will continue in the future. It is expected that the LED will challenge many of the existing light sources when it comes to energy efficiency, eventually.

Each individual LED measures only a few millimetres allowing for smaller constructions and considerable savings in raw materials, packaging, transport and recycling costs. The technology also allows for better controlled beams of light thus reducing the amount of light that is wasted, as in the case of an incandescent and halogen lamp (present products used in accent and decorative lighting).

Small but perfectly formed, the LED technology is an exciting development and is widely viewed as the long-term future for lighting, particularly in helping to reduce the worldwide energy consumption. With a host of benefits and more to come, the technology promises to revolutionise the functionality and performance of a range of lighting applications.



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