



LOOKING AT LAMPS IN A NEW LIGHT

Robin Day of EcoLED Lighting puts forward the case for LEDs as the next step forward in lamp technology and lighting design

In general, artificial lighting in buildings is achieved by luminaires fitted with common filament (incandescent) lamps or traditional and compact fluorescent tubes or lamps. This arrangement has been almost unchanged in more than 100 years. This is mainly because of widespread familiarity: the technology and systems are fully understood and the common applications are endless. Alongside this, most people are comfortable with both the range of light sources available and the associated cost implications.

Increasingly, however, the associated cost and efficiency of conventional light sources is being questioned: Global warming and environmental awareness are leading to widespread changes in attitudes towards energy consumption further driven by education and law. This situation means new alternatives in lighting technology are more necessary than ever before.

Taking the LED

One alternative light source that has emerged in the last ten years is the Light Emitting Diode (LED). The technology is now breaking through into the general lighting market, and this trend is set to continue as purchasers become aware of the substantial benefits LEDs have when compared to conventional lighting. Initially the LED lighting industry targeted the commercial and

military aerospace industries where the benefits of applying LED lighting technology achieved substantial energy savings. These savings are compounded by a massive reduction in maintenance costs. LED lighting represents a major opportunity to reduce the running costs of exterior and interior lighting of homes, public and commercial premises and anywhere the cost of conventional energy (i.e. mains electricity) is high or not available (remote locations, for example).

There are also other long-term benefits, not least of which is a lower TCO (Total Cost of Ownership) associated with an LED lighting scheme. This reflects not only the cost of purchase but all aspects in the further use and maintenance of the scheme. As an example, the (typical) total life of an LED is 100,000 hours (10+ years) with minimal degradation of light output. Unlike typical conventional light sources, LEDs are not subject to sudden failure or burnout as there are no filaments to burn out or break. And as all commercial organisations will appreciate, this eliminates the extremely high cost of periodic re-lamping and regular maintenance.

Wide application

A situation we are all familiar with is the increasing demand – and the requirement for reductions – placed on our fossil fuel

supplies. And this is where LEDs could have the biggest impact. If used as a replacement for an existing light source, it is possible to reduce the voltage mains power from 110Vac or 240Vac, to 12Vdc or 24Vdc. This offers substantial reductions in power consumption over traditional systems. As a comparison with conventional mains powered lighting solutions, savings of 80%-95% are not uncommon.

This wide range of working voltage options is possible because LEDs only require tiny amounts of power to operate efficiently. This complements the drive for new methods of power generation such as solar or wind-generated power. Indeed, by using solar or wind-powered technology, the savings are considerably greater simply because sunlight and wind are free!

There are also operational efficiencies associated with LEDs. For example, low heat output. The maximum LED operating temperature is typically 60°C rather than the 300°-450°C of conventional lighting solutions. This vastly cuts down the energy that is wasted, and heat pollution is reduced to a minimum to offer potential savings in air conditioning running costs.

With LEDs the quality of 'white' light can be tailored to suit the human eye – eliminating eye strain, which in certain working and living environments can have adverse and costly health and safety implications. LEDs do not produce ultraviolet light and can be perfectly matched to a specific 'colour index' for industrial and regulatory standards.

Light pollution is virtually eliminated as light output from LEDs is directional, only directing light where it is required. This is highly efficient as no light is wasted when compared to conventional lighting where light is typically omni-directional from bulbs or tubes. Beams are available from 2°-135° for specific light guidance from light source.

LED lighting systems are environmentally and ecologically friendly. Other than the massive reduction in use of conventionally generated energy, there are no poisonous elements used in component manufacture, such as mercury and other noxious and polluting gases. For every 10KWh of useable energy generated by a solar panel, 7Kg of carbon dioxide gas is saved from being produced and entering the atmosphere.

Part L compliance

Following on from the Government's initiative to lower industry carbon emissions, April 2006 saw the new Part L1A, L1B, L2A, L2B building regulations come into effect. In addition to tightening up on other building energy standards, the amendments also regulate the efficiency of lighting systems in the construction of new buildings. Combined, the Part L amendments require all commercial buildings to produce 28% less CO₂ than was formerly allowed.

EcoLEDLighting took on the engineering challenge of designing a highly efficient power supply to power the most efficient commercially available LEDs through our optimised optical conversion. The result is a unique UK designed and manufactured product, which is Part L compliant using LED technology. The LED must be driven from a switch mode constant current source to maintain LED drive efficiency. Also, you cannot get a warm white Part L compliant LED yet, so we use a combination of the higher efficiency cool white LEDs (6,500 Kelvin) and boost the output of the lower frequency light ranges.

The luminous efficacy of particularly the lower frequency LED light reduces significantly with increasing temperature; it is vitally important to maintain a low operating temperature. This is achieved in the EcoLEDLighting MR16 lamp by operating the LEDs

well within their parameters and having an extremely efficient thermal path from the LED to the heat sink on the rear. In real terms, the LED efficiency starts off at an average of 70 lm/W (dependent on LED bin selection) and reduces to 45+ lm/W following power supply efficiency and optical efficiency in the lensing at nominal operating temperatures.

The EcoLEDLighting MR16 12W Part L compliant replacement further complies with Part L by having a bespoke MR16 bayonet, which includes a locking mechanism via two tamper-resistant screws. It is not possible to refit a dichroic or halogen bulb replacement into an EcoLEDLighting MR16 replacement fixture. All our products are specifically designed and manufactured in conjunction with our technology supply partners and benefit from continued high output lighting and durability to the maximum predicted component life and, as such, many elements of our designs are patented and copyrighted.

Case Study – Airbus A380

In designing the new Airbus A380 aircraft, designers were sensitive to profit implications from weight of fuel versus carried payload: More flights were to be completed for less fuel cost and increased cargo payload. By choosing LED lighting and the consequential 80% reduction from conventional lighting cabling mass, the low voltage requirement meant that ¾ ton of on-board generators were not needed. Fuel usage will also drop by as much as 6¼ tons per trip (typically 240 tonnes required for the Sydney/LA flight) or 7 tons of additional passengers/cargo. The principal saving will be the reduced cost of running the power generation sub-systems and air conditioning but with the added value of the elimination of ongoing of maintenance costs.

- Further information from Niki Molnar, EcoLEDLighting, WSR Building, Longwood Business Park, Fordbridge Road, Sunbury on Thames, Middlesex TW16 6AZ. Tel: 0845 094 6010. Fax: 0845 094 6020. E-mail: niki@ecoledlighting.com Website: www.ecoledlighting.com

