Future of green lighting

By F Mitchell, Drive Control Corporation

Lighting consumes a large amount of electricity, and compact fluorescent light (CFL) bulbs have become popular because they offer improved efficiency. However due to increasing environmental concerns around CFLs, Light Emitting Diode (LED) lamps are emerging as the most eco-friendly, energy efficient solution for lighting.

Improving energy efficiency and reducing consumption is a growing concern in South Africa, driven by dramatically increased utility costs and global trends towards eco-consciousness. Given the continuous increases in the price of power from the national utility, many organisations and private homes are looking for ways to reduce their costs. Lighting is undeniably an area for improvement when it comes to optimising energy consumption, as up to 50% of industrial and 25% of home power usage can be attributed to this. As a result, one of the easiest ways to lessen energy consumption and reduce carbon footprints both in homes and commercial spaces is to switch out standard light bulbs for more efficient, lower consumption lamps.

Incandescent lamps

Traditional tungsten filament bulbs, also known as incandescent lamps, were invented in the 1800s and the technology has not evolved much since. These bulbs produce light by using electricity to heat a filament.

Light is simply a by-product of this heating process, which makes incandescent lamps an archaic and highly inefficient technology since up to 90% of the energy used by the bulb is converted to heat. Aside from this obvious waste of electricity, the bulbs have a short life span and must be continuously replaced, at cost to the environment in terms of land fill and carbon emissions from manufacturing.

In fact, many governments around the world have begun to introduce measures to phase out incandescent light bulbs for general lighting purposes in an effort to encourage more energy efficient lighting alternatives. These countries include Brazil, Venezuela, Australia, the European Union and Switzerland. Other countries including Argentina, Russia, Canada, the USA and Malaysia are planning scheduled phase-outs for the future. In light of this trend it stands to reason that South Africa cannot be far behind.

Halogen bulbs

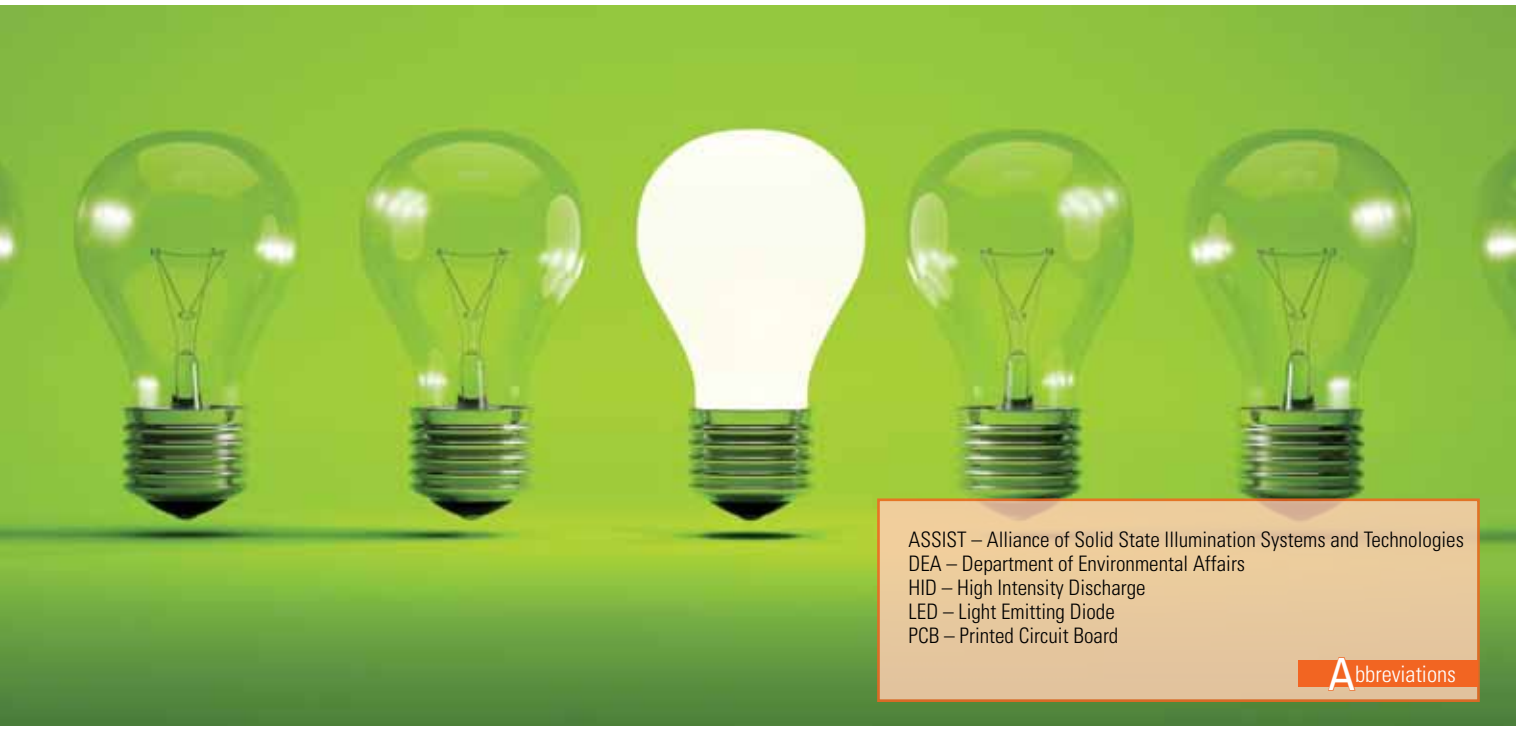
Halogen bulbs are another lighting technology which while it also uses a tungsten filament, lasts longer than incandescent bulbs. The filament is encased in a small quartz envelope, along with halogen gas, which combines with the tungsten atoms at high temperature as they evaporate. This is then re-deposited on the filament when the bulb cools down, a recycling process that ensures that halogen bulbs last a lot longer than incandescents. Because the filament also runs hotter, more light is emitted per unit of energy, making these bulbs also more efficient. However a halogen bulb is still considered inefficient and is extremely hot compared to a normal light bulb, which limits its use in home and office applications.

Compact fluorescent lights

Compact fluorescent light (CFL) bulbs are one technology that has been touted as the ideal replacement for tungsten filament. In fact a few years ago the South African government introduced an extensive awareness campaign around this, even going so far as to encourage people to bring their existing incandescent lights to shopping centres where they would be exchanged, at no cost, for an equivalent CFL.

A broken bulb

The reality for the environment however is far from ideal. While it is true that CFLs are far more efficient, using less than a quarter of the power to run, and can last up to ten times longer than filament bulbs, they also contain mercury, a toxic substance that is harmful to people, animals and the earth. This mercury is essential to CFL technology, and although only a small amount is used in each bulb there is still reason for concern.



ASSIST – Alliance of Solid State Illumination Systems and Technologies
DEA – Department of Environmental Affairs
HID – High Intensity Discharge
LED – Light Emitting Diode
PCB – Printed Circuit Board

Abbreviations

While the mercury is contained within the glass, there is no risk. However light bulbs are easy to break, and once these are broken the mercury vapour is released into the environment. When a CFL bulb is broken in the home, special precautions should be taken to prevent people and pets from inhaling this poisonous gas.

Any air conditioning or heating systems should be shut off to prevent the gas from being spread, and a window should be opened to allow the room to air out. Vacuum cleaners and brooms should not be used, since they too will spread and distribute the mercury vapour through the air. Any cloths used in the clean-up should be disposed of. Pieces of broken glass should be carefully moved onto a piece of stiff paper or cardboard and places in a sealable glass jar. Sticky tape should be used to remove all remaining traces of powder and glass and also placed in the glass jar. This jar then should then be disposed of specially.

The process for cleaning up a broken CFL is long, involved and fairly complicated for a household accident that could occur at any time. Even when a CFL bulb is not broken, because of the hazardous nature of mercury vapour these bulbs are considered toxic waste and need to be specially disposed when they burn out.

However many users of CFLs remain unaware of this, simply throwing the bulbs, broken or whole, away with regular garbage. This garbage ends up on landfills, where the mercury has a cumulative effect, polluting the earth, the air and potentially the ground water, exposing people, plants and animals to unhealthy levels of this harmful gas.

Environmentally friend-less

The upshot of this is that while CFL bulbs may be energy efficient and their use is encouraged, they are not environmentally friendly. Many people believe they are doing the environment a favour by replacing incandescent bulbs with CFLs, but the reality could not be further from the truth.

Thankfully for those who wish to become more eco-friendly not only by saving energy but also by promoting environmental consciousness, there is a new technology which is both highly efficient and environmentally friendly, is available to directly replace both incandescent and CFL bulbs.

LEDs

LEDs are basically diodes that convert energy directly into light through the movement of electrons in the semi-conductor material. While this technology may have existed since the 1960s, its applications until recently tended to be limited to computers, circuit boards, traffic lights and electronic billboards because of the unidirectional nature of the light they produce and the fact that originally they could only produce primary colours of light, in other words red, blue and yellow.

However, advances in the technology in the last decade not only enabled LEDs to produce white light, but have also enabled them to be clustered together to produce light that mimics the multi-directionality of incandescent and CFLs.

Due to the very nature of an LED, which uses the movement of electrons to generate light, they lose far less energy to heat than other light technologies - they are up to 85% more efficient than filament bulbs, and even around 5% more efficient than CFLs. They do not produce a significant amount of heat, so cooling requirements in lighting intensive environments are reduce, and they contain no poisonous gasses, so are eco-friendly.

Recent improvements to the technology also mean that the white light emitted can be produced in warm, cool and neutral tones to adapt lighting scenarios as needed. This means that they can be used to directly replace other lighting technologies in any scenario from the home to the office to the shop front.

Lifespan

Unlike both incandescent and halogen bulbs, LEDs do not contain a filament that can burn out, and they run extremely cool, so they also have an incredibly long lifespan. While the life of an LED is something

which is still up for debate given the new nature of the technology, it is generally agreed to be somewhere in the region of between 10 and 20 years depending on the type of bulb, the application, the voltage and other factors.

For the purpose of illustration, one can work on a lifespan of around 35 000 hours, or 16 years in real terms working on six hours of usage a day. This is in comparison to a standard incandescent bulb, which may last up to 1 000 hours. Over the course of 16 years, the succession of standard bulbs would have consumed 1 400 kilowatt hours, compared to just 350 for the LED bulb, translating into far higher energy costs. The cost of 35 standard light bulbs over the years also far outweighs the higher cost of the LED bulb, and the carbon emissions produced from one LED bulb are just 175 kg over its lifespan, compared to 700 kg produced by 35 incandescent bulbs.

Aside from this, once they do eventually reach end of life, LED lamps can be easily recycled along with ordinary glass, and if they end up in landfills they will not cause lasting environmental damage due to toxic chemicals.

Conclusion

For both consumers and business, in light of an increasingly eco-conscious planet and the need to optimise energy consumption, LED lamps offer the best of both worlds, delivering superior energy efficiency, incredible lifespan and an environmentally friendly lighting technology.

Fred Mitchell started in the IT industry in telesales at Drive Control Corporation (DCC) in 1999. After four and a half years at DCC he moved to another distributor where he gained experience and knowledge in the software space and completed his MBA. In 2006 Mitchell returned to DCC where he established the company's software security division. In 2009 Mitchell was promoted to symantec business unit manager and has since led the DCC symantec team to many successes, including multiple 'distributor of the year' awards.
Enquiries: Fred Mitchell. Tel: 011 201 8927 or email fredm@drivecon.net.

About the author