



**T**he spectacular opening ceremony of the 2008 Beijing Olympic Games shown live to billions of television viewers around the world signalled a major commercial step forward for LED lighting, showcasing the technology embedded in the main stadium we came to know as the Birds Nest. Since Beijing, development for large scale LED lighting around the world has continued at speed. Los Angeles has begun a five-year program to install LED as street lights, saving the city US\$10 million dollars in power bills and reducing its carbon emissions by more than 40,000 tonnes per year.

German giant, Hella also announced recently it will move production into LED street lighting. For U2's latest world tour a giant 24m x 16m 360-degree LED screen has been constructed. In Texas, the world's largest high definition LED stadium screen has been unveiled for the Dallas Cowboys at a cost of US\$40 million – it measures 22m x 49m. But what does all this mean for the Australian consumer? Importantly it means that some LED technology currently up on the world's stage is going to filter down to become the preferred and affordable alternative to CFL – 10 times more efficient in terms of power required and lasting five times longer. The global market for general-purpose LED lighting is currently very small, but it is growing rapidly as the technology improves and costs go down. Sales of LED-based lighting products have grown 40–60 per cent annually in recent years and they are expected to reach \$1.6 billion by 2012. Yet to be resolved is the cost issue, while LED or "solid state" lighting is rapidly dropping in

price, it remains several times more expensive than traditional lights. Each of the three largest players in the traditional lighting market, Philips (the Netherlands), OSRAM (Germany), and General Electric (US), has developed a strong presence in LED lighting through joint ventures and acquisitions of specialty firms. While these traditional lighting giants have so far played a leading role, they face competition from new LED firms, especially in Japan, Taiwan, South Korea, and other Asian countries.

**History of LED**

LED lighting started with extensive research in the early 1960s when Texas Instruments, General Electric and RCA Laboratories were researching and developing the technology. They discovered that miniature crystals (gallium arsenide) gave off infrared radiation when electric current was applied. That became the first (infrared) Light Emitting Diode. Then came the first visible spectrum (coloured-red) Light Emitting Diode. Light emitting material had been around since the early 1900s but not properly researched. Different forms of gallium as well as other crystals determine the colour of the LED. Blue LEDs were invented in 1971. White, green, blue, UV, yellow, amber and yellow LEDs went into commercial production in the early '90s. Red LEDs have been used in scientific and indicator devices since the early '70s. The history of the LED goes back to 1907 with a form of electroluminescent material.

THE FUTURE OF LIGHTING



By Stephanie Leung  
VIBE Lighting

AS INCANDESCENT LIGHT GLOBES ARE PHASED OUT IN AUSTRALIA AND WE ARE BEING ENCOURAGED TO REPLACE THEM WITH MORE EFFICIENT COMPACT FLUORESCENT LAMPS, IT'S LED LAMPS THAT ARE POISED TO BE OUR FUTURE SHINING LIGHT.

Efficient VIBE 7-watt LED downlights replace power hungry halogens



Samsung LED Television

**U** While these traditional lighting giants have so far played a leading role, they face competition from new LED firms

China's Birdsnest Stadium



LED Technologies, Australian made LED Technologies truck light technology leads the world

**Applications**

The number of LED solid state lighting products is growing rapidly, including recessed downlights, under-cabinet and ceiling fixtures, portable lights, lights for retail displays and outdoor lighting for streets and parking stations. On a larger scale, LED technology has advanced to the point where an entire factory in Wisconsin, US, was able to light its new facility with LEDs, both interior and exterior. Although the initial cost was three times more than a traditional mixture of incandescent and fluorescent bulbs, the extra cost will be repaid within two years from electricity savings and the lamps should not need replacement for 20 years. Australia's newest arena, Melbourne Rectangular Stadium in Melbourne, has taken a leaf from China's Birds Nest stadium – all external and perimeter lighting in the new stadium is LED. Chances are your torch at home is powered by an LED lamp, your solar powered garden lights, the lights on your bicycle, the trailer and brake lights on the next truck you see, the underwater lights in your backyard swimming pool, your LED backlit television screen, your home theatre and much of the display lighting you see in retail.

LED is all around you already.

**LED compared to other lighting technologies**

Incandescent lamps (light bulbs) create light by running electricity through a resistive filament, thereby heating the filament to a very high temperature so that it glows and produces visible light. A broad range of visible frequencies are naturally produced, yielding a pleasing warm yellow or white colour quality. Incandescent light however, is highly inefficient, as approximately 98 per cent of the energy input is emitted as heat. A 100-watt 240 AC light bulb produces about 1700 lumens, about 17 lumens per watt. Incandescent lamps are relatively inexpensive to produce. The typical lifespan of an incandescent lamp is around 1000 hours, which work well with dimmers. Most existing light fixtures are designed for the size and shape of these traditional bulbs. Fluorescent lamps (light bulbs) work by passing electricity through mercury vapour, which in turn produces ultraviolet light. The ultraviolet light is then absorbed by a phosphor coating inside the lamp, causing it to glow, or fluoresce.

ABOUT LED

LED stands for Light Emitting Diode. LED bulbs and tubes use diodes to produce light making them the most energy efficient of all lighting systems. Arguably LED produces the healthiest form of light (known as full spectrum) - the closest to natural sunlight available. LED lights do not require starters or ballasts and so are more durable and longer-lasting than their fluorescent counterparts - expect up to 50,000 hours from an LED. LED lamps can be made interchangeable with other types, but presently at a higher cost. Most LED lamps must also include internal circuits to operate from standard AC voltages. LED lamps offer long life and high efficiency, but initial costs are higher than that of fluorescent lamps.

LED BENEFITS

What are the benefits of LED Lighting?

- 1 Low power consumption compared to conventional lighting.
- 2 No ultra-violet output. The UV component of conventional lighting can cause damage to fabric.
- 3 Very little heat is produced in the light output, reducing the cost of building air conditioning and allowing lighting to fit into positions too small for conventional lights.
- 4 Lamp life is very long; most LED manufacturers estimate 100,000 hours.
- 5 Ecologically friendly.
- 6 Light weight manufacture.
- 7 Coloured light can be produced by controlling the power to each primary colour, so no power is wasted.

U2 uses a large LED screen on stage

VIBE LED downlight centre tilt with 3 X 3W LEDs

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