PLASMA LIGHTING

David Morgan looks at a technology that may become a viable energy efficient light source for the next ten years

Hidden away amongst the multitude of LED luminaires and LED light sources at this years Lightfair in New York there were a few exhibitors swimming against the tide, presenting the latest innovations in a lighting technology that has recently become a viable alternative; plasma lighting.

Luxim, Ceravision and Eden Park are some of the companies exploring the potential of this approach and developing luminaires and sources for a variety of lighting applications.

In essence plasma lighting consists of a discharge lamp without electrodes, where the power is transferred from outside the lamp enclosure via high frequency electromagnetic radiation. It is a lighting technique that has been around in different forms for many years. Nicholas Tesla patented one version in the late 19th Century and induction lamps are available from a number of manufacturers although they have not made much of a commercial impact. The very high output sulphur lamp from Fusion lighting with its rapidly rotating arc tube that was going to revolutionize the lighting industry as a remote light engine in the 1990s was perhaps the strangest variant of this technology. Surprisingly it is still in production and is available from Plasma International which appears to have a niche market in light pipes and other applications where high levels of light can be employed.

It is only comparatively recently that point light sources based on plasmas have become technically and commercially viable.

The plasma technologies on show at Lightfair included high output point sources, panels and linear sources similar to CCFLs so there is a lot of activity in this area.

Currently the most successful approach for high power point sources is based on microwave excitation of an argon gas and metal halide mix to create a gas plasma. One version of this technology was presented in New York by the US company Luxim. The Luxim LIFI light engine has already been incorporated into a number of luminaires for the entertainment market including the Nemo Seachanger projector, which won an innovation award at Lightfair, and the Robe Plasma spot. Luxim are also now focusing on the architectural, commercial and street lighting markets.

The legal tussle about plasma lighting technology patents between Luxim and the UK company Ceravision has now been settled and both companies are now pursuing their own development paths.

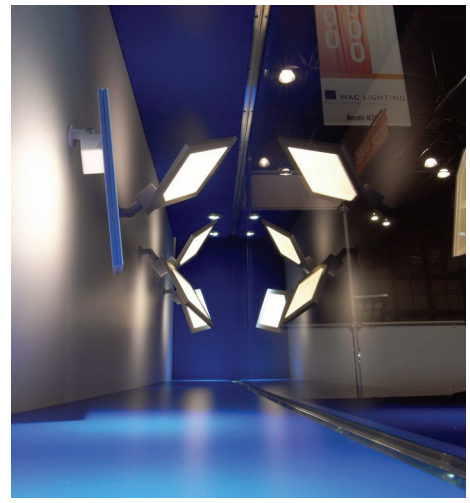
The Ceravision team based at Bletchley Park have re-designed the concept behind plasma lighting with their own innovative and patented approach and will be launching a range of high bay lighting products in the next few months targeted at commercial and industrial lighting applications. Ceravision will also supply their plasma light sources for incorporation in other manufacturers luminaires in due course.

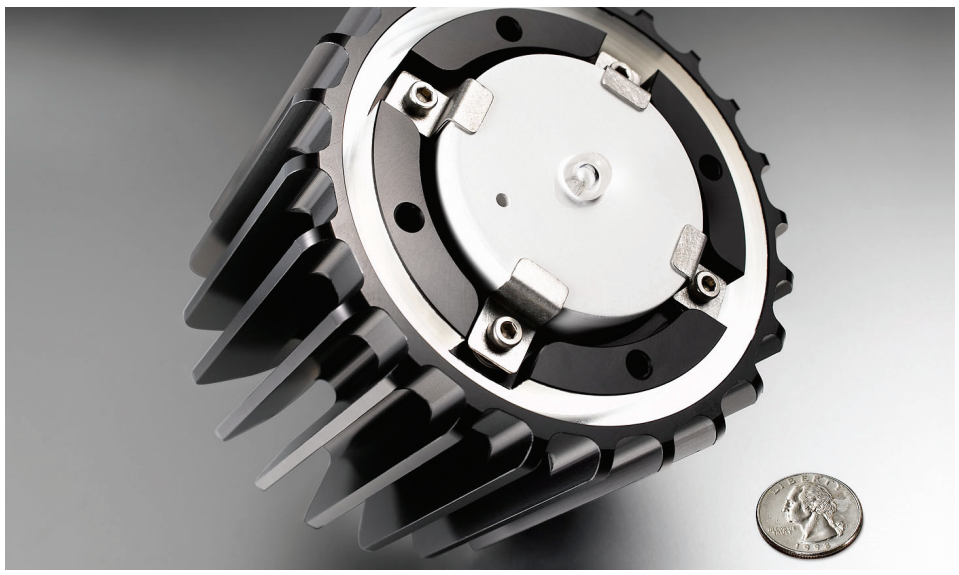
The Ceravision system provides high efficiency, long life, high quality white light that can be dimmed down to 10% and can be restarted within a few seconds while hot – it sounds just what we have been looking for all these years.

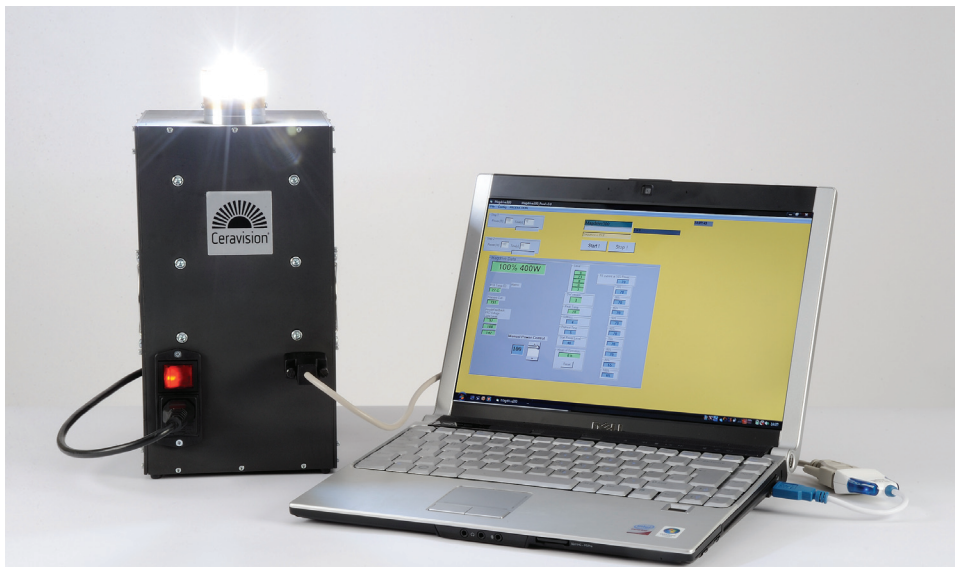
System efficiency of over 100 lumens per Watt is claimed with a usable system life of up to 40,000 hours and low lumen depreciation during life. The system is scalable from 70 watts up to 5 kW, the lamp can be produced in mercury free versions and apparently can be easily recycled at the end of life.

The claimed CRI is in the 90 – 95 range and as it dims the colour remains white. As the lamp dims the CRI is said to remain constant. The colour consistency from lamp to lamp is also claimed to be very good but without seeing a whole row of pendants or floodlights using the source it is not possible to be sure about this yet. From the demonstrations that I have seen so far the light quality is very usable for general commercial, sports and industrial applications and large retail spaces.

The Ceravision power supplies will be







Above The Luxim LIFI light engine (below) has been successfully incorporated into a number of luminaires for the entertainment industry including the Nemo Seachanger projector, winner of a Lightfair innovation award

Bottom left Eden Park's panel utilises fluorescent lamp technology where UV is used to excite a phosphor to generate light

Bottom right Ceravision's lamp provides a claimed system efficiency of over 100 lumens per watt with a usable system life of up to 40,000 hours and low lumen depreciation during life

available as simple stand alone units or as networkable devices that will send lamp operational data to a central unit so that performance and problems can be continuously monitored.

The final bonus and perhaps the most significant one is that the system is simple and uses established low cost 2.4 GHz microwave technology ensuring the system cost is, understood to be comparable to good quality metal halide lamps and electronic ballasts. The power supply technology is provided in partnership with the Swedish company Dipolar, who were also involved with the Fusion lighting plasma source and have over 25 years experience in the development of microwave power supplies.

In other words plasma lighting is likely to be much more cost effective and usable for high power general lighting applications than LEDs.

While Luxim and Ceravision have been working on high power point light sources, Eden Park have developed what they term a microplasma panel as an alternative technology to O LEDs for use in flat panel lighting

The Eden Park panel utilises fluorescent lamp technology where UV is used to excite a phosphor to generate visible light. The electrodes are external to the microplasma cavities where the UV is generated ensuring that the panel working life will be much longer than fluorescent lamps – it is currently projected to be over 50,000 hours. The panels are very thin – only 3mm - contain no mercury and at the current state of development provide over 30 lumens per watt, which is projected to rise to 100 lumens per watt in the near future. The power supply is very similar to an electronic fluorescent ballast.

An ideal application for this technology includes illuminated surfaces where the long lamp life, low heat and high efficiency will be important features. The use of OLEDs for this application has been proposed but the low efficiency and high cost would seem to make microplasma panels a more likely bet. The technology has been developed over the past ten years at the University of Illinois by Professor Gary Eden and his colleague Dr Sung Jin Park.

Lightfair 2009 was the first introduction of the panels and the plan is to launch a series of standard panels up to 400mm x 400mm in size at Light and Building next April.

So while LEDs are now moving into the mainstream lighting market with driver incorporated GLS and CFL replacement lamps. Plasma lighting may become the new big idea in energy efficient high quality lighting.