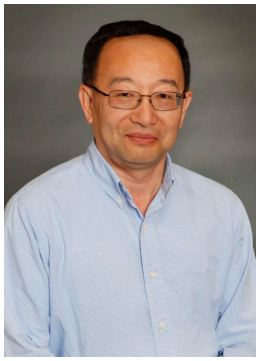
What role will sensors and controls play in emerging solid state lighting applications? (Part II)

Q: What role will sensors and controls play in emerging solid state lighting applications?



Xiantao Yan, CTO and founder of LED Engin,www.ledengin.com [1]
Solid-state lighting technology is a natural fit in our digital, wireless world. Adaptive control and wireless sensor networks are the key to ever more sophisticated LED lighting schemes including dimming, color-tuning and remote control features. While LED-based luminaires are clearly the future for a wide range of lighting applications, there are many challenges to overcome. There are technical challenges (complexity, upgradability, interoperability) and commercial issues (time to market, cost of ownership). In short, sensors and controls in many cases for LED lighting are far from simple to use, and they can be expensive to incorporate into lighting designs. We see a number of trends that will contribute to solving some of these critical issues: higher levels of integration, system-level design, and programmability. The objective is to leverage the strengths of LEDs and utilize existing digital and wireless technologies to evolve the lighted environment. Integration means LED modules as well as software and ‘system on chip’ circuits. More highly integrated components, with built-in networking and control features will simplify the design and vendor choice for end customers. System-level design supports multiple applications providing flexibility to fixture manufacturers and end customers. For example, if you’re providing a platform for customers who can have a choice of control network protocols and interoperability standards or a system that supports simple analog, DMX and I2C interfaces, and can easily interface with a variety of microcontroller and SoC devices to provide ZigBee and other WiFi protocols. With a WiFi protocol, compatibility issues associated with dimmers are eliminated and there is no need for rewiring. System cost is much lower than before. The inherent programmability of today’s microcontrollers is the key to reconfigurability and future-proofing. Applying fast-moving technology to long-lived lighting schemes means that upgrades will be needed. Forward-thinking vendors will be supplying pre-programmed modules that can be simply reprogrammed when

necessary. For example, a pre-set dimming feature provides smooth, incandescent-like dimming from 3000K to 1800K along the blackbody curve. And with a different software setting, customers can set up alternate color tuning ranges to meet individual preferences.

Tom Hinds, Product Manager, Lighting,www.cree.com [2]
Sensors and controls will play an important and increasingly common role in solid state lighting applications. LEDs are far easier to dim compared to other energy-efficient light sources, like fluorescent, which make LEDs a perfect match for sensor and control technologies. Beyond compliance with energy and building codes like ASHRAE 90.1 and California's Title 24, it just makes sense to pair sensors, controls and LEDs together to deliver an efficient, long-lasting solution for lighting. The marriage of sensors, controls and LED luminaires is a natural progression for LED technology and building requirements. Fast payback and better return-on-investment from longer lifetime and increased energy savings will only help to further drive adoption of LED lighting. With the cost of LED luminaires steadily decreasing, the payback will only get better.

Rob Woodhouse, Design Manager at Marl International, www.leds.co.uk [3]
The increasing global market demand for solid-state lighting technology carries with it the demand for intelligent control systems via the interaction of a multitude of wireless smart sensors interacting, communicating and controlling the lit environment. This new generation of control systems will provide unlimited customisation of ambient lighting schemes and requirements for lighting designers of the future. Human health, relaxation and productivity can be modified and induced with changes in light hue and colour wavelengths to levels unheard of in the past. When it comes to energy savings, a new generation of sensors and control systems will energy harvest from the environment, scan for natural daylight illuminance and check occupancy levels to dramatically reduce power usage and energy demands in office blocks, industrial units, street lighting and commercial environments. When combined with ultra-efficient LED light fixtures of the future, the possible savings will be in the billions of of pounds per year (1,000's of tera-watt hours) per country in just a couple of decades. Not only will developed countries profit from this but also third-world countries where energy sources are scarce and many locations have to rely on harvesting solar, thermal, hydro and wind energy. To realise this, sensor chip designers and manufacturers will have to make devices more intelligent, densely populated and integrated to carry addressable control, transmit and receive communications and energy harvest using thermal, RF, light and vibration frequencies. This will be made possible with nanotechnology and system-on-chip silicone fabrication coming out of the research labs. Advances in sensor power and complexity carries with it the need for exponentially higher computing power for complex data feedback algorithms and

front end user interfaces to control the environment in real-time. As with all new technology, the complexity and power behind the scenes provides the simplicity of the user interaction and advances to the worldpounds per year (1,000's of tera-watt hours) per country in just a couple of decades. Not only will developed countries profit from this but also third-world countries where energy sources are scarce and many locations have to rely on harvesting solar, thermal, hydro and wind energy. To realise this, sensor chip designers and manufacturers will have to make devices more intelligent, densely populated and integrated to carry addressable control, transmit and receive communications and energy harvest using thermal, RF, light and vibration frequencies. This will be made possible with nanotechnology and system-on-chip silicone fabrication coming out of the research labs. Advances in sensor power and complexity carries with it the need for exponentially higher computing power for complex data feedback algorithms and front end user interfaces to control the environment in real-time. As with all new technology, the complexity and power behind the scenes provides the simplicity of the user interaction and advances to the world.

Go to Part 1: **[4]** ***What role will sensors and controls play in emerging solid state lighting applications?***

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