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

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Rich Green, Senior Vice President of Engineering, Enlighted, Inc. www.enlightedinc.com [1]

Where will the Internet of Things make its big commercial debut? Probably a few feet above your head. Intelligent sensing systems — installed and configured in overhead lighting systems and combining motion, temperature and light sensors with microprocessors, imagers and LEDs — will transform how people interact with homes, offices and public spaces. Advanced lighting, of course, will greatly reduce power consumption. Lights account for 22 percent of the energy consumed in the commercial sector, and a substantial portion of it gets wasted. But the real benefit of this unification will come through a newfound ability to navigate the surrounding environment. You can’t tell if a conference room is occupied unless you look. You might hear a sound in the garage at your home at night, but you can’t tell what caused it unless you investigate. Lighting-based sensing will shift from being a passive, neglected necessity to a powerful extension of your senses. Intelligent lighting will enhance the scope and performance security systems or let you pinpoint the location of a co-worker in a multistory building. Retailers will use lighting to monitor checkout lines or mine foot traffic patterns. Make no mistake: in a few years you will be able to see through walls.

Tim Jackson, Manager, Emergent Technologies, Microsemi Corporation,www.microsemi.com [2]

Now that DC power is readily available in the SSL fixture, the cost required to integrate sensors and control functions into individual fixtures is reduced

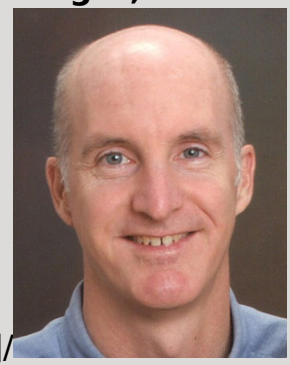
significantly. In addition, the more advanced SSL power supplies

utilize a low cost microcontroller IC to implement digital control loops, temperature sensing, and other functions within the power supply. With DC power and an MCU already embedded into the cost and design of the SSL power supply, the fusion of sensors into the SSL fixture becomes much more cost-effective. As an example, integrating an occupancy sensor control into an MCU-based SSL power supply requires firmware modification, an op amp to buffer the sensor signal, and a few wires; the costs of which are negligible compared to that of the overall fixture. In addition, a sensor-enabled SSL fixture can now be installed at the same cost as a basic fixture (with no additional sensor to install and no additional wiring to route). As a result, the building efficiency will improve through individual control of that fixture. As the transition to SSL fixtures continues and MCU-based power supplies proliferate, the integration of sensors into the SSL is inevitable. In some cases the sensor integration may be as simple as occupancy control to turn the fixture On or Off, or light sensing which allows the light to automatically dim in conjunction with ambient light conditions. By adding communications to the fixture, additional sensing functions such as temperature, sound, vibration, chemical/gas detection, etc can be integrated and monitored on a fixture-by-fixture basis. With the initial wave of SSL adoption in process and increased understanding of the inherent capabilities of SSL fixtures, expect sensor fusion to be the second wave of evolution for energy efficient lighting.

Colin Faulkner, Product Manager, Smart Home and Energy Product Line, NXP Semiconductors,www.nxp.com [3]

With solid state lighting solutions rapidly becoming the light source of choice for new installations, many options arise for the deployment of sensing and controls. The inherent long life and controllability of these sources facilitates the introduction of new sensing and control scenarios and the higher initial costs mean that adding control functionality is a smaller percentage overhead. The availability of low cost, low power, wireless controls based on ZigBee or JenNet-IP mean that the colour and brightness of each lamp can be individually controlled, with no installation costs associated with control wiring. This enables fine granularity of control so that, for example, each office worker can adjust the lighting to suit their individual needs and it can be switched off when they are away from the desk. Occupancy sensors wirelessly linked into the control system can detect if people are present in common areas like dining rooms or meeting rooms, and light level/colour sensors can adjust the local lighting to take account of ambient light from windows etc. The combination of new control systems with different types of sensor will enable the development of highly responsive and effective lighting systems based on technology available now.

Jim Toal, Senior Manager, Product Marketing, Vishay Semiconductors,



www.vishay.com [4]/

Sensors will play an increasing role in solid state lighting in the home and industrial lighting. In the home, an ambient light sensor will be used in its most basic function to automatically turn lights on and off based on the lux level in the room. They can also be used to maintain a defined lux level, turning lights off when outside sunlight fills the room and adjusting the modulation of lighting as the sunlight level changes due to clouds or time of day. This is a form of sunlight harvesting and can be a great energy saver. LED wavelength and luminosity shift due to temperature, dimming, aging, and binning. Multispectral color or RGB sensors will be used to compensate for these shifts. They can also be used in conjunction with RGB LED lighting in a feedback loop when a specific room color is desired. In industrial and street lighting, ambient light sensors will be used as they are now to turn on and off the lights based on the lux level. One major benefit of solid state street lights is that in the wee hours of the morning, the lights can be dimmed to 50 percent modulation, delivering significant power savings. Active infrared, passive infrared and embedded magnetic sensors will be used to adjust the lights when pedestrians or cars are entering and exiting an area. In both home and street lighting remote control units and receivers will be used to adjust the lighting and to change traffic lights in emergency situations.

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Source URL (retrieved on *05/26/2013 - 12:57am*):
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