

June 14, 2017

Advanced Classroom Lighting

Energy costs for lighting comprise a significant operational expense for schools and universities, but past energy conservation strategies for classroom lighting have typically reduced lighting quality while not addressing opportunities for increasing student engagement and teacher satisfaction. With the help of [DOE funding](#), RTI International and Finelite have developed and tested an LED-based next-generation integrated classroom lighting system (NICLS) that makes it easy for teachers to control light levels and chromaticity in three classroom zones, and also incorporates daylight harvesting to further reduce energy consumption. The project focused on more than just efficacy; one of the objectives was to spur demand for energy-efficient lighting in schools by demonstrating some of the potential non-energy benefits of easy-to-control tunable lighting in future classrooms.



The heart of the NICLS technology is an LED module consisting of separate assemblies of warm-white and cool-white LEDs. Together with sensors and a controller, the NICLS fixtures form a made-in-USA system operated from a user interface that's either mounted in the front of a classroom or accessed

through a wireless handheld device, and that was designed based on input from more than 80 teachers and school administrators. A touchpad controller contains presets that accommodate typical classroom activities, such as modes for watching a presentation on a video monitor or tablet or for group instruction at a whiteboard. The system is customizable and has easy slider controls to manually adjust the CCT and light intensity.

During the research and development of this technology, an NICLS demonstration site was built in Finelite's manufacturing and sales facility in Union City, CA, and extensive tests were performed, with modifications made to improve energy efficiency and reliability. Among the achievements:

- Continuous tunable white light ranging in color between warm white (2700K) and cool white (6500K), delivered at a luminous efficacy >125 lm/W at all CCT values. According to the developers, this level of performance represents more than a 25% improvement in energy efficiency over fixed-CCT fluorescent lights, and better than a 22% improvement over the average fixed-CCT LED luminaires listed in the [LED Lighting Facts](#)[®] database.
- Integrated sensors that can harvest daylight in the classroom and selectively dim luminaires to maintain a constant lighting level – thus further reducing energy consumption.
- LED light sources that can last for more than 10 years of typical use, with <15% decrease in light output. In contrast, conventional fluorescent lighting technologies require replacement every three to five years.
- A simple, energy-efficient, glare-free lighting system that's easy to install, conforms to all applicable building and electrical standards, and meets or exceeds all DOE goals for system-level performance in the "classroom of the future," including luminous efficacy, color rendering, vertical and horizontal illuminance, and product reliability.

In addition to the project's technical achievements, the tailored control settings and user interface will enable teachers to customize the lighting for their students' preferences and needs. For example, a warm CCT at a dimmed level might cue students for a more relaxed, subdued atmosphere after recess; while a brighter, cooler setting might signal students that it's time to concentrate for taking a test. As research into the measurable effects of different lighting parameters on educational outcomes continues to emerge, this type of tunable lighting system will allow teachers to adjust the classroom lighting for different activities, based on the latest findings.

This project illustrates how taking a system-wide approach to solve an application problem resulted in a wide range of benefits for those who use the space. In addition to tackling key technological issues and keeping fixture costs low, the project also aims to achieve rapid commercialization, which will foster job creation in the U.S.

Best regards,
Jim Brodrick

As always, if you have questions or comments, you can reach us at postings@akoyaonline.com.