SSL Postings
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LED Adoption by Museums: Survey Results and Recommendations

The recent switch to LEDs to illuminate Michelangelo's masterpiece on the ceiling of the Sistine Chapel is just one of the latest in a series of high-profile installations that show how far the technology has come — not only in terms of its acceptance and adoption, but also in terms of its performance. But solid-state lighting is a long way from being a slam-dunk in such settings, where the heightened stakes can magnify the importance of some of SSL's remaining issues. To shed light on the matter (pun intended), in June 2014 Pacific Northwest National Laboratory conducted a survey of museums on behalf of DOE, the Getty Conservation Institute (GCI), and the Canadian Conservation Institute (CCI). The responses and recommendations — which are presented in a new GATEWAY report, *SSL Adoption by Museums: Survey Results, Analysis, and Recommendations* —offer valuable insights for manufacturers as well as for specifiers and museums.

The report analyzes the survey responses of 46 members of the museum community who had requested a copy of the document *Guidelines for Assessing Solid-State Lighting (SSL) for Museums,* a pivotal resource that was written in 2011 by Jim Druzik of GCI and Stefan Michalski of CCI. Most of the survey responders were museum directors, designers, conservators, curators, and those involved in collections care and registration, and about a third were international.

More than two-thirds (68%) of the responders placed a high priority on energy efficiency. But respondents indicated they won't sacrifice potential damage or light quality/aesthetics to achieve it. However, they acknowledged that lighting quality is not necessarily diminished by higher source efficacy, and that it's possible to achieve both high lm/W and high-quality LED performance.

More than half (51%) identified incandescent as their principal lighting type, with LED at 40% (compared to almost none in 2009), CFL at 13%, linear fluorescent at 11%, and others (including metal halide, halogen, and daylight) at 22%. Color, spectral power distribution (SPD), and damage potential were the main considerations in lamp selection, with affordable, high-performing, attractive products that won't become obsolete considered key. When evaluating potential damage, the majority considered ultraviolet and infrared content and about half considered short-wavelength emissions in the SPD.

Although 75% of responders experienced early LED product failures, the maximum reported failure rate was only 2.5% of the installed lamps or fixtures. The most-noted sources of failure were electronic components (drivers, power supplies) rather than the LED sources themselves. Respondents indicated they're looking for warranties that cover LED chips and electronics, lumen depreciation, and color shift, and some are even looking for warranties that are longer than their return-on-investment period.

When asked whether they would consider and implement another LED installation, 71% indicated yes; 6%, no; and 32% of the responders said they already had. When evaluating the success of the installed LED lighting, responders solicited feedback from groups of observers — unanimously favorable from the public, and 97% favorable from museum staff.

Dimming was generally deemed important to achieve required low light levels down to 5 fc (50 lux). Nearly two-thirds (over 65%) of the responders would use lighting controls if they worked with their existing lamp-based infrastructure and afforded lamp-by-lamp control of light intensity (and, if possible, chromaticity). They would also like the ability to monitor lux levels on an object-by-object basis. Dimming incompatibilities still exist and, due to the added challenge, older systems of mechanical controls (e.g., screens) are still being used to modify lamp light output because they are simple, inexpensive, and effective.

It was clear from the survey that museums would use controls if they were user-friendly and not prohibitively expensive. Wireless controls would be easier to retrofit, because no additional control wires need be run between the dimmer and the load; and luminaires equipped with a wireless receiver could be individually dimmed to customize light output for a specific object. This would allow for setting and maintaining illuminances within conservation parameters (thus more easily tracking lux-hours on an object-by-object basis) and provide additional energy savings compared to using screens to reduce output. However, survey responders indicated that at this point in time, controls are too complicated, which is likely to change in the coming years.

Respondents were skeptical about the predicted life of LED lighting products, due to the lack of “real” proof. Although L_{70} (the point where lumen depreciation reaches 30%) is often accepted as the typical failing criterion, this is not always adopted by the museum community; significantly shorter lifespans, such as 5,000 hours, are frequently used in economic analysis.

Overall, the questionnaire responses and comments showed that there is still confusion about different LED products and what museum staff should be asking for, and concerns about maintenance. It was clear from the responses that education and experience are needed at multiple levels.

For more details on the study, see the complete report.

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